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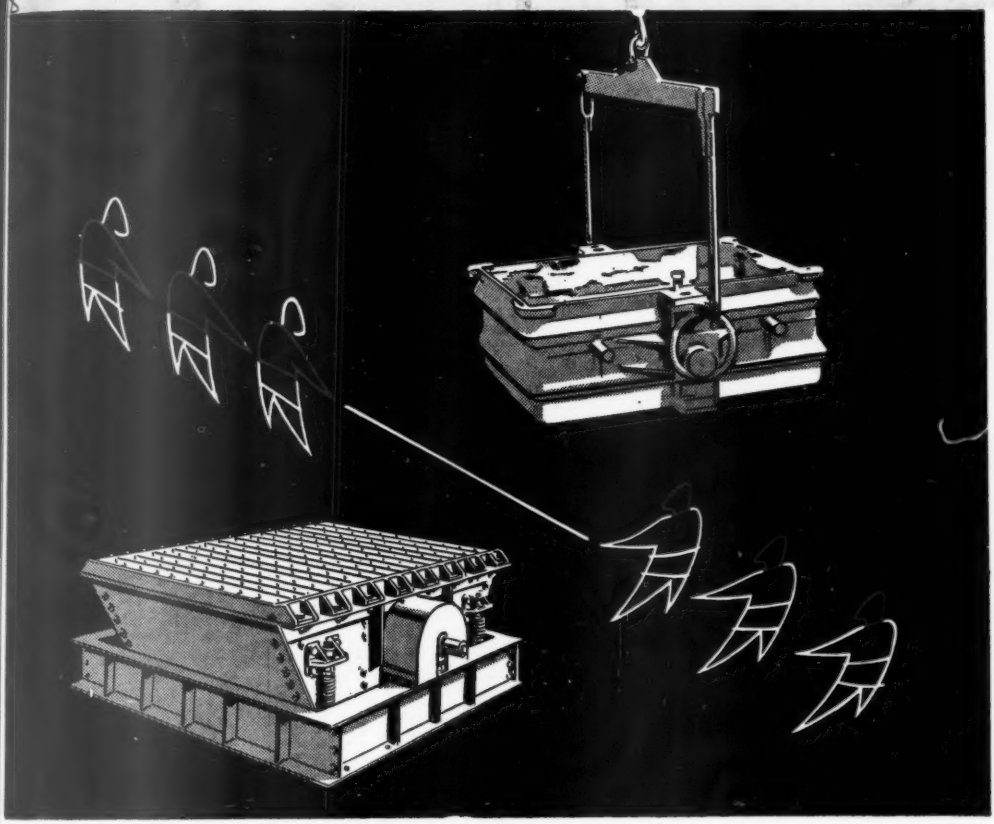

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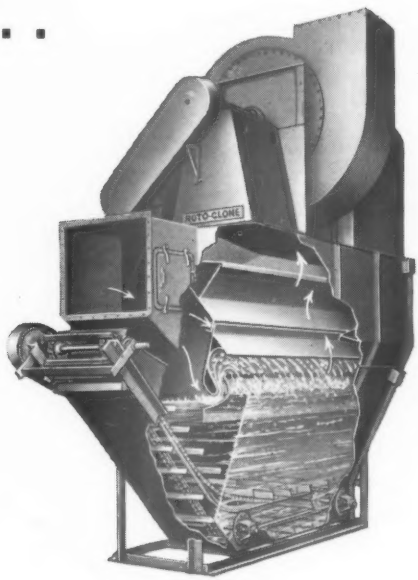

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PRINCIPAL CONTENTS

Technical : PAGE

Green-sand Moulding of Large Steel Castings, by Charles W. Briggs:
Basing his research on a study of 33 American foundries, the Author details types of sand used and bonding agents. Such problems as quality control, pattern damage, draw difficulty, mould drying, finishing, etc., are next dealt with, and finally the advantages of using the green-sand moulding method are enumerated . 35

Return of Big Ben:
A description of the intricate work carried out to restore Big Ben to its former status, together with a report of other repairs to the Houses of Parliament and the Palace of Westminster involving castings . . . 47

Cupola Experiments—Discussion:
Topics discussed include the carbon lining installed in the cupola, difficulties with skip charging, charge:blast ratio and the potentialities of hot blast . . . 51

Receivers, Tapping Systems and Slag Disposal—Discussion:
Account of the discussion which took place when the report of the IBF Technical Council's sub-committee TS.44 was presented at the Cardiff conference last year 53

Features :

Leader: Selling Points 33
Forty Years Ago 34
Notes from the Branches 55
Book Review and New Catalogues . . 57
Forthcoming Events 66

Commercial :

New Patents 56
Imports and Exports of Iron and Steel in November 60
Raw Material Markets and Contracts Open 62
Current Prices of Iron, Steel and Non-ferrous Metals 64

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Selling Points

There is a close relationship between the problems besetting the American foundry industry and our own and the question of whether founders' sales efforts are keeping pace with technology is one which can be asked with equal force on both sides of the Atlantic. Recent years have seen the mechanization of our foundries; new processes, such as shell moulding, the CO_2 Process and cold-setting core techniques, and alloys giving higher mechanical properties than were ever imagined possible before the war. Users of castings have read all about these in the technical Press, but have failed to realize that every one of these developments results in either increased dimensional accuracy, better machining properties, shortened delivery times or other major benefits.

The representative of a firm supplying castings, who by telephone or personal call makes contact with a buyer, usually concentrates on the smaller objective of some particular job—its intricacy, price, delivery, the patterns supplied or needed. That is insufficient. The user must be informed of any developments which have taken place and be invited to the foundry so that he can be fully informed, and, may be, co-operate in the field of service tests. As full discussion may encroach too much on the user's time, it is wise to send some appropriate matter emphasizing that technical developments are not being undertaken just to satisfy the curiosity of the staff but to give better service in some direction to the customer. Unless this is appreciated by the customer, he imagines that the net result of a new development is the creation of a process which saves the foundry money in either materials or labour but is of no external interest. This is particularly the case when the user hears only indirectly the announcement of a foundry development. Too readily, he suspects the founder has suppressed deliberately the news of a manufacturing economy from which he, the customer, ought to benefit. From then onwards he is prone to taunt the foundryman with " holding out on him," and lack of confidence between founder and customer results.

Before a firm's customers can know of these important innovations in foundry practice, it is obvious that whoever is selling castings must be the first, not merely to hear of them, but to learn all about them; to become enthusiastic as to their worth and be in a position to share this with the customers. Castings are the most difficult thing in the world to sell, and nothing is more helpful than the inculcation of the user's interest in the processes and techniques used in their manufacture. One foundry manager realized only too late that had he but visited his customer's works before instead of after losing an order he could have retained some very profitable business.

F

Quality Control in Non-ferrous Castings

The Institute of Metals in association with the Institute of British Foundrymen have organized a symposium on "Metallurgical Aspects of the Control of Quality in Non-ferrous Castings," to be held at Church House, Great Smith Street, Westminster, London, S.W.1, on Wednesday, May 1, commencing at 9.30 a.m. The eight papers contributed, which will be presented by a rapporteur (Dr. W. A. Baker, research manager of the British Non-Ferrous Metals Research Association) are as given below. Visitors will be welcome at this meeting. Tickets of admission are not required, but it would be appreciated if non-members would advise the secretary of the Institute of Metals, 17, Belgrave Square, London, S.W.1, of their intention to be present.

Papers to be presented at the symposium are as follow, the authors being shown in parenthesis: "Metallurgical Principles of the Control of Quality of Non-ferrous Castings" (R. W. Ruddle, M.A., F.I.M., and A. Cibula, M.A., A.I.M.); "Role of Statistical Methods in Controlling the Quality of Non-ferrous Castings" (A. R. Martin, B.SC., A.R.S.M.); "Metallurgical Aspects of Quality Control in the Production of Aluminium-alloy Castings" (A. V. Carless, A.I.M.); "Metallurgical Control of Quality in the Production of Copper-base Alloy Castings" (A. R. French, F.I.M.); "Control of Quality of Magnesium-base Alloy Castings" (E. F. Emley, PH.D., F.R.I.C., F.I.M., and P. A. Fisher, A.I.M.); "Control of Quality in the Production of Nickel-alloy Sand Castings" (D. R. Wood, M.A., A.I.M., and J. F. Gregg, B.SC.); "Control of Quality in Pressure-die-casting" (H. J. Sharp, M.SC., A.I.M.); and "Non-destructive Testing for Quality Control of Non-ferrous Castings" (S. L. Fry).

Clean Air Conference

As briefly announced in the FOUNDRY TRADE JOURNAL of November 15, 1956, the Institution of Mechanical Engineers is to stage a conference in London from Tuesday to Thursday, February 19 to 21, on the theme of the "Mechanical Engineers Contribution to Clean Air." The technical sessions will be held in the Central Hall, Westminster, at 7.30 p.m. on the evening of the first day and from 10 a.m.—12.30 p.m. and 2.30—5 p.m. on the other two days. In addition to the paper on "Dust Problems in the Iron and Steel Industry" by Prof. M. W. Thring and Dr. R. J. Sarjant, already mentioned, a new inclusion on the programme is a paper by W. B. Lawrie, M.B.E., on "Foundry Atmospheres."

Participation by members of certain other bodies who are interested in the subject of the conference is invited, whether or not they are members of the Institution. The registration fee is £1 5s. (which includes buffet refreshments on the Tuesday evening) and reply forms should be returned to the secretary of the Institution as soon as possible by those who intend to be present.

New Data Sheet

ALAR, LIMITED, of 3, Albemarle Street, London, W.1, have issued a copy of the latest addition to their data sheets. It describes the properties and characteristics of the aluminium/silicon/magnesium alloy to BS. 1490, LM8, in the as-cast and heat-treated conditions.

Fifth Supervisors' Course

The Council of Ironfoundry Associations is now providing regularly a short residential course for supervisors, the programme of which is designed to clarify by lectures and discussions the responsibilities of the foundry foreman and his relations with the men in his department, fellow supervisors, technical advisors and senior management.

The fifth course of this kind was held from January 1 to 4 at Tor Lodge, near Wolverhampton, the hostel of the National Foundry College. Men in supervisory positions from foundries in England and Scotland attended, and all were able to take an active part in the discussion groups and case studies which were an important part of the programme. Mr. J. B. McIntyre and Mr. W. B. Hendry assisted Mr. J. J. Collett, the CFA training officer, throughout the course, and visiting speakers were: Dr. J. G. Pearce, O.B.E., director, British Cast Iron Research Association, who gave an opening address on the present position and future trends in ironfounding; Dr. H. T. Angus, development manager, British Cast Iron Research Association, who spoke on "Safety in the Ironfoundry"; Mr. J. D. Dwyer, personnel officer, Birmingham Battery & Metal Company, Limited, on "Industrial Law—What the Supervisor Should Know"; Mr. W. E. Harrison, cost consultant, on "Foundry Costing"; Mr. W. S. Matthews, J.P., training officer, Stanton Ironworks Company, Limited, on "Training the Young Worker"; Mr. J. E. Spear, director, John Harper & Company, Limited, on "What Management Expects of the Foreman"; Mr. T. Wylie, a senior lecturer at the College of Technology, Birmingham, on "The Foreman's Rôle in Industrial Relations." Mr. J. J. Collett spoke on "The Supervisor's place in Management" and Mr. W. B. Hendry dealt with "Work-study in the Foundry" and followed this with a showing of three films illustrating varied applications.

Comments

The subject voted top of the list for interest by the men attending was industrial law, closely followed by work-study. In commenting on other aspects of the course, many of those present said they would have liked more time spent on discussion of problems in human relations and on "rôle playing", designed to improve their skill in handling such problems.

This course, like its predecessors, brought together men of widely different backgrounds and experience. Once the initial introductions have been made among members of the group, these differences prove to be an advantage, in that they serve to prompt each man to question some of the assumptions on which he has acted and to realize that others in a similar situation have dealt with the same problems differently. On the other hand, he finds that the difficulties which he thought peculiar to his circumstances are shared by supervisors in very different circumstances. To date, these short courses have been held only during the vacation of the National Foundry College. Already provisional bookings have been made to fill nearly all the places available at course No. 6 from April 8 to 12 inclusive, and further courses will be arranged to meet the demand as it arises.

THE COUNCIL OF IRONFOUNDRY ASSOCIATIONS announces that the title of the Cast Iron Pipe Association has been changed to the Cast Iron Pressure Pipe Association, and the secretary of the Cast Iron Segment Association is now Mr. W. Rose of the Stanton Ironworks Company, Limited, P.O. Box 3, Nr. Nottingham.

Green-sand Moulding of Large Steel Castings*

By Charles W. Briggs

Mr. Briggs covers very fully the method of producing large steel castings by the green-sand moulding method. He has made a study of 33 foundries in the US and Canada and this has revealed valuable information on the techniques and difficulties of the process. Most of the 33 foundries use washed-and-dried silica sand as the base of their sand mixture, with a minority using raw sand or a blending of raw and washed sand. A majority of these foundries use a facing sand made up of all new, new and reconditioned, or only sand in conjunction with backing-up by used sand. The bonding agents used include Western bentonite, kaolin fireclay and organic bond or cereal. Other sand additions made according to the particular application or type of sand are silica flour, wood-flour, iron oxide and sulphite liquor. The sand mixture is generally mulled in batches of 1,400 to 1,700 lb. and the order in which the additions are made varies, being established under two opposing philosophies and these are discussed in the Paper. The main difficulties of the green-sand moulding practice are related to quality control, e.g., failure to ram the moulds properly. Other problems are pattern damage and draw difficulty as a result of ramming to high hardness, mould drying during ramming, and finishing, scabbing and metal penetration. The advantages of the adoption of green-sand moulding are enumerated at the end of the Paper, to include lower cost because of lower drying costs; shorter moulding time; good mould accuracy, and less hot-tearing.

Initially the Author defines the terms he uses throughout the Paper and the types of castings dealt with. Next, types of raw sands, sand mixtures, clays and other additions, facing-sand properties at room and elevated temperature are discussed seriatim, *with notes on sand-reclamation methods practised in the various foundries reviewed. All-purpose sand, backing sand, sand milling, transport and storage are next considered and sections follow on "nailing," mould hardness, skin-drying, mould washes, and, finally, on green-sand cores. Throughout, it should be borne in mind that the Author, even in his general statements, refers only to the 33 American steel foundries which come within the weight range and terms of reference under which the survey was prepared.*

Charles Willers Briggs is technical and research director of the Steel Founders' Society of America, the trade association of the steel-castings industry. He has published numerous technical articles on subjects relating to steel-casting production. He is the author of the "Steel Castings Handbook" and "Metallurgy of Steel Castings" and enjoys an international reputation in the field of steel-casting technology. He has received the McFadden Gold Medal of the American Foundrymen's Society, the Mehl Gold Medal of the Non-Destructive Testing Society, and the Electric Furnace Steel Conference award of the American Institute of Mining and Metallurgical Engineers. As a member of the Technical Industrial Intelligence Committee, Mr. Briggs represented the United States Government and its allies, in Germany, in the immediate post-war period, where he studied and reported on the technique developed by Germany and Austria in their steel-casting industries. He is a member of the American Institute of Mining and Metallurgical Engineers, American Society for Metals, American Foundrymen's Society, American Society for Testing Materials, the Society of Naval Engineers, and the Non-Destructive Testing Society.

Definition of Terms

The production of large steel castings in green-sand moulds is a comparatively recent development. Activities along these lines began during the latter part of World War II and attained a rapid growth during the time of the Korean affair. The method was born out of the necessity for the maximum production of large steel castings but the developments have been so promising and beneficial that the foundries which have adopted it will not return to the old dry-mould practice, even during periods of slack production.

There are several terms that should be defined prior to a general discussion of the moulding methods, *viz:*

Green-sand Mould. A green-sand mould for large steel castings is one that consists of silica sand, a clay-type binder (which is usually bentonite), organic bonds and water. After the mould has been produced with this moulding mixture, it is either permitted to air dry or is skin dried prior to pouring.

Air Drying. The time of air drying may be short, such as only the time it takes to put the mould together, or it may be a long air-drying period of several days (especially if the mould is completed near the end of the week and air drying takes place over the weekend).

* American contribution presented at the International Foundry Congress held in Düsseldorf.

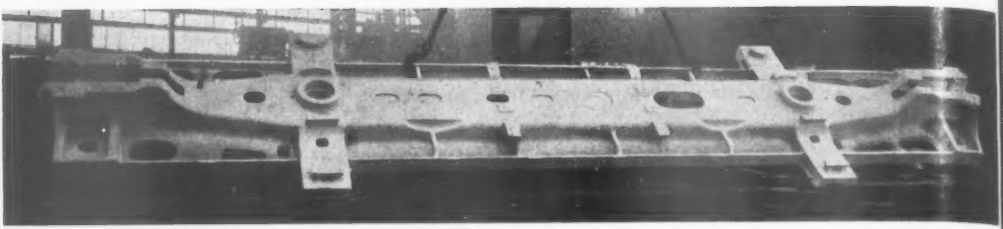


FIG. 1.—*Cast-steel cab underframe for a* 1,000 *h.p. Diesel/electric switcher — General Steel Castings Corporation.*

Skin Drying. The mould metal surfaces of the green-sand mould may be dried for short periods just prior to pouring. Drying is accomplished either by using portable gas torches before assembly of the mould or by using portable forced-air dryers at riser openings after the moulds have been closed. It is understood, of course, that the drying period is, in any case, a short one and only the sand which is within a short distance of the mould cavity face is dried. Such a sand layer is frequently described as a mould skin. Air drying is likewise a skin-drying method as the moisture from the green-sand mould migrates to the mould surfaces. However, the moisture content of air-dried moulds is greater than that of torch-dried moulds.

Large Steel Castings. Large steel castings are those that weigh more than 2 tons. In some cases, the castings may be rangy and have large overall dimensions. For example, two large castings of 5 tons may vary so that one has maximum section thickness of 10 in. whereas the other has maximum section thickness of only 2 in. Typical examples from the range produced in America in green-sand moulds are shown in Figs. 1 to 6.

Clay-type Binder. Nearly all steel foundries in the United States and Canada employ Western (Wyoming) bentonite to bond the sand in green-sand moulding. A few foundries employ kaolin fireclay as either a full bond or a supplementary bond. The bentonite so employed is the sodium type; a typical composition being as follow: SiO_2 60.89; Al_2O_3 22.17; Fe_2O_3 3.27; FeO 0.42; FeS 0.21; MgO 2.77; CaO 1.28; Na_2O 2.49; K_2O 0.40; TiO_2 0.18; CO_2 0.51; SO_3 0.52; minor constituents 0.02 and H_2O 4.87 per cent.; pH 9.25 and viscosity 22.5 cp. Western bentonite separates into extremely fine particles when dispersed in water. The dispersion is as follow: 96 to 97 per cent. finer than 44 microns; 93 to 94 per cent. finer than 5 microns; 87 to 89 per cent. finer than 0.5 microns; 60 to 65 per cent. finer than 0.1 microns.

It is estimated that one cub. in. (16.4 cc.) of dry Western bentonite, when disintegrated in water, will yield 9,500 billion individual flakes with a total surface area of about one acre. Western bentonite has base-exchange properties; in water solution it gives up sodium and potassium ions and takes in calcium and magnesium ions, thus softening the water slightly. It also enters strongly into base exchange with organic bases, extracting them from solutions of their salts. The exchangeable metallic bases of average Western bentonite determined quantitatively by leaching with ammonium acetate are: sodium 85.5 m/e per 100 gm.; potassium 5.0; calcium 22.0; magnesium 1.0; sum —corrected for sulphates—89.2.

Type of Castings Produced

There are 31 steel foundries in the United States and two in Canada producing castings weighing over 2 tons in green-sand moulds. There are an additional 16 foundries that produce large steel castings but they do not employ the green-sand practice. The pouring weight of the castings from the 33 foundries range from 3½ to 38 tons. Section thicknesses will vary from two to 36 in. depending on casting application. The major casting applications, weights and maximum section thicknesses are given in Table I.

TABLE I.—*Weights, Thicknesses and Applications of Large Green-sand Moulded Steel Castings.*

Applications.	Maximum weight (tons).	Maximum thickness (in.).
Anvils, die blocks	9 to 13	12 to 36
Anchor flukes, ship-hull castings	3½ to 18	4 to 10
Mill housings	4½ to 13	4 to 18
Press cylinders	2½ to 9½	12 to 25
Ordnance castings	6½ to 13	5 to 7
Frames; crane, truck, press ..	3½ to 16	3 to 10
Roll housings	4½ to 9	10 to 18
Hammer rams	3½ to 5½	30
Tyre moulds	3½	4 to 6
Valve body	2 to 4½	2 to 4
Turbines	13 to 19	15 to 24
Bucket lips	2 to 4	3 to 5
Engine and car underframes ..	18 to 37½	4 to 10
Trunnions	7½ to 10	18 to 22
Impellers	4½ to 5½	2 to 3
Slag pots	3 to 6½	3
Miscellaneous	3½ to 8	8 to 22

Sand Base

Most foundries (21) of those considered have a preference for a washed and dried silica sand as the base of the sand mix; 11 foundries employ a crude sand exclusively and one foundry employs a semi-natural silica sand which contains from 3 to 5 per cent. clay. Four of the foundries that use the washed silica sand also obtain a crude sand and blend the two together to establish their base sand. The crude sand is used as it is mined and this sand usually has from 2 to 5 per cent. of silt, fines and clay.

The grain shape varied from the round Ottawa sand to the semi-angular New Jersey sand and the angular Glassrock sand. The sand source and number of procuring foundries is presented in Table II.

TABLE II.—*Sand Deposits.*

Type of sand.	Foundries using.
Ottawa, washed	Six
,, crude	Four
New Jersey, washed	Five
,, ,, crude	One
Portage, washed	Five
,, crude	Five

Most of the foundries (25) employ one grade of sand; however, eight foundries blend two grades of sand. The blend grades are preferred because the foundries obtain a wider grain-size distribution. An effort to secure a sand with four adjacent screens having over 10 per cent. each is considered desirable. Some of the foundries that do not use a blended sand indicate that they would prefer to do so but storage facilities are not adequate and they are thereby restricted to a single grade.

The grain fineness of the purchased sand varies considerably. If the average AFS fineness number is calculated for the sand, they would have the following distribution:

AFS fineness No.	Number of foundries.
Under 44	5
45 to 49	10
50 to 54	7
55 to 59	6
60 to 65	5

It should be indicated that there is a slow but gradual shift to the finer sands for large castings as there has been for the small castings. The use of the finer sands permits reduction in the quantities of silica flour employed, and also prevents rapid drying out of sands during mould construction. Sieve analysis of the sands shows that 15 of the sands have a four-sieve sand distribution and two sands a five-sieve grain distribution of more than 10 per cent. of the sand on four or five consecutive sieves. A typical sand in each of the sieve-analysis classifications set out is given in Table III.

TABLE III.—*Sand Analysis of Typical Sands in the Various AFS Fineness Classifications.*

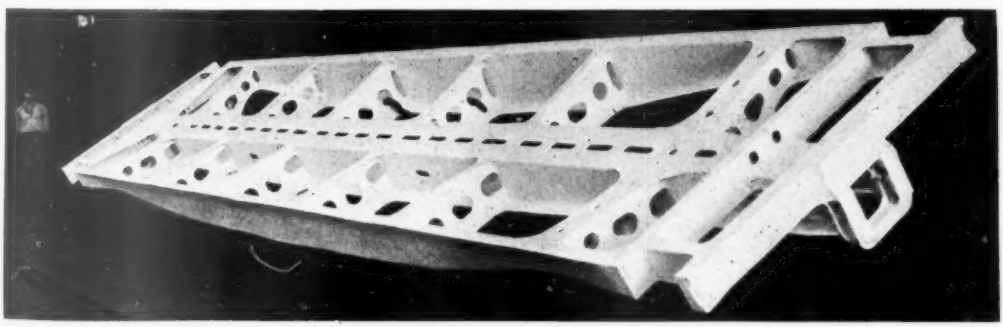
		AFS fineness No.				
		Under 44	45–49	50–54	55–59	60–65
Per cent. retained on sieve.	20	6.9	0.1	—	—	—
	30	17.6	2.3	1.1	—	1.5
	40	28.0	19.6	8.1	3.6	16.0
	50	124.5	30.0	31.3	28.4	25.3
	70	5.6	27.7	35.5	37.2	24.1
	100	5.8	15.2	17.6	20.4	15.6
	140	0.9	3.9	5.3	6.8	10.4
	200	0.3	0.5	0.7	2.4	5.3
	270	0.1	0.3	0.2	0.8	1.4
	Pan	0.1	0.2	0.2	0.4	0.4

Facing-sand Mix

A large majority (75 per cent.) of all steel foundries prepare an all-new facing sand for the green-sand moulding of large castings. The two most important ingredients of the mix are, of course, bentonite and water. The bentonite content of these sands will normally be from 4.5 to 5.0 per cent.; outside limits being from 3.8 to 6.0 per cent. The reason for the rather wide variation depends on three possibilities: (1) a green-compression strength of about 8 lb. per sq. in. is desirable for large moulds; (2) a fine grain-size, such as AFS 63, will require more bentonite than a coarse-grain sand to secure the same green-compression strength; (3) additions of silica flour usually require an increased bentonite content because of the fine particle size of the material.

Kaolin clay is, in certain cases, added to the mix. However, the kaolin addition is accompanied with bentonite and is slightly less than or equal to the bentonite addition. The total of the two will average about 5 per cent. clay content. Kaolin clay produces a mould of a higher hot-strength than can be obtained with bentonite alone. High mould-strength to prevent deformation of the mould is necessary for castings of thick section. It is seldom that kaolin clay alone is used as the bond for green sands for large castings. Large quantities, upwards of 8 to 10 per cent., are required to secure strong moulds; the reclamation problems are more complex because of increased fines and dust, and

FIG. 2.—*Cast-steel underframe for a 50-ton pulpwood car, 53 ft. long—General Steel Castings Corporation.*



the green-plasticity and flowability of the sand is much inferior to the bentonite-bonded green sands.

The water content for sand for large green-sand moulds is on the high side if normal green-sand practice for small castings is considered. A value of 4.2 to 4.8 per cent. is normal; however, a range from 3.7 to 6.0 per cent. is possible. If the sand is coarse-grained, such as AFS 35 to 45, large quantities (10 to 15 per cent.) of silica flour are usually required and consequently the water content of the mix will be on the high side, or 5.5 to 6.0 per cent., in order to prepare a sand of good workability and green compressive strength.

Other Additions

Only about 50 per cent. of the US foundries find it necessary to add silica flour to the mix; foundries producing heavy-section castings of 8- to 36-in. thick normally add silica flour. Also, as indicated earlier, foundries using very coarse sands will likewise use silica flour. The silica-flour addition will vary from 2 to 16 per cent. depending upon the two requirements mentioned earlier.

The other addition to the green-sand mix that is universal is an organic bond or cereal. There are two types: (1) a gelatinized corn flour, and (2) dextrine. The two cereal bonds are often added to the mixture together. Dextrine produces improved green-strength and very much greater dry-strength than corn flour but the latter develops greater flowability and plasticity. They are similar in character yet complementary. The total cereal addition is about 1 per cent., the range in values being from 0.5 to 1.2 per cent. addition. The cereal bond is also useful in retarding drying out of sands. Moulds from sands that do not contain cereal bond are usually brittle and the surfaces rub off or powder easily.

Many foundries desire to develop hard and firm mould surfaces. To assist them in securing this property, they add small quantities of sulphite liquor derived from the pulp-paper industry. This bonding agent may be added as a liquid or as a powder. The material is not universally used in the USA, as records indicate only 25 per cent. of the foundries producing large castings by the green-sand practice employ it; the quantities employed vary from 0.3 to 1.0 per cent. The larger amount is added when the cereal/binder content is low. The firm surface is obtained by the migration of the sulphite liquor to the surface with the water, during the air- or torch-drying of the mould.

Other additions that are possible, depending on the foundry's programme of formulation of the mix are, wood-flour, iron oxide and pitch. Wood-flour is only added if the silica-flour content is high. Values of about 0.5 per cent. are employed to reduce the scabbing tendency, because of the high hot-strengths resulting from the employing of 10 to 15 per cent. silica flour. Iron oxide is added in place of silica flour to close the coarse-grained sand and to prevent veining. Usually quantities of about 0.5 per cent. of the mix are employed. Pitch can be used as a substitute for cereal binders; however, it should be indicated that it is but seldom adopted. Examples of the various types of new facing-sand mixes for large green-sand castings are given in Table IV.

TABLE IV.—*Examples of Facing Sand for Large Green-sand-moulded Steel Castings.*

	A	B	C	D
Sand, AFS No.	60	55	45	50
Bentonite, per cent. ..	5.1	3.3	2.8	5.5
Clay, per cent.	—	2.2	2.0	—
Cereal, per cent.	1.0	0.8	0.5	0.5
Water, per cent.	4.6	5.0	6.0	5.0
Silica flour, per cent. ..	—	3.0	15.0	—
Sulphite liquor, per cent...	—	—	—	0.7
Wood-flour, per cent. ..	—	—	0.5	—
Green compressive strength, lb. per sq. in.	8.0	7.2	8.2	7.5

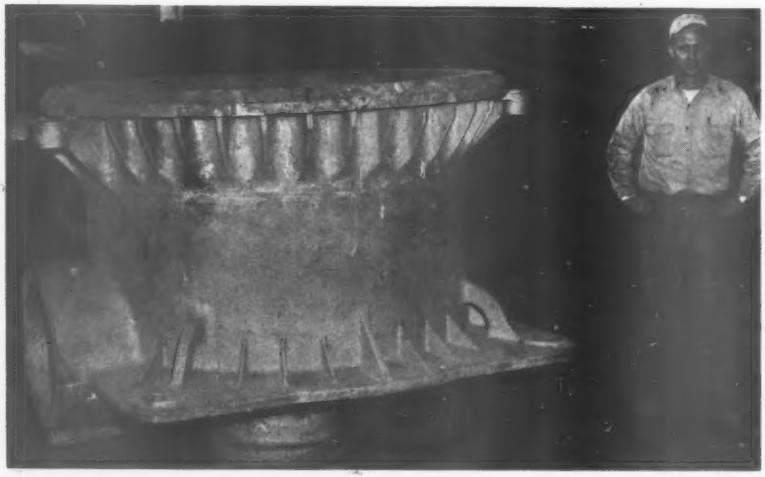


FIG. 3.— *Rock-crusher main frame, weight 5 tons—Locomotive Finished Material Company.*

Properties of New Facing Sand

The green-compression strength for new sand facings varies between limits of 6.0 to 9.5 lb. per sq. in. for the mixtures quoted. A value of 8.0 lb. per sq. in. is considered typical. Permeability values range from 70 to 250 depending upon the grain fineness and the

type of additions to the sand. Large quantities of silica flour will reduce the permeability number to the low figure of 70. It is the Author's experience that the permeability number of a green sand is of little value provided a minimum number of approximately 70 is obtained; its only use is a check value in routine sand analysis. A record of the permeability value helps to keep the sand within the limits set for quality control. Steel foundries in the USA seldom report the dry-strength properties of green sand as they are not correlated to any high-temperature properties of the sand. The flowability value is always between 75 and 85. Examples of the high-temperature properties of green sand are given in Table V.

TABLE V.—*Examples of the High-temperature Properties of Various Green Sands.*

	M.	O.	P.	S.	V.
Mixture—					
Bentonite, per cent. ..	4.8	4.2	4.7	5.3	3.8
Water, per cent... ..	4.0	3.5	6.5	4.5	5.0
Cereal, per cent. ..	0.85	0.5	0.3	1.7	0.8
Sulphite liquid, per cent.	—	—	—	1.1	—
Silica flour, per cent. ..	—	2.2	16.0	—	16.0
AFS grain size	62	51	46	55	50
Room-temperature Properties					
Green compressive strength, lb. per sq. in.	7.2	6.5	8.2	6.5	7.5
Permeability	125	175	70	95	70
High-temperature Properties					
Hot compressive strength, lb. per sq. in—					
at 260 deg. C. ..	—	150	—	135	—
at 537 deg. C. ..	—	135	440	100	—
at 818 deg. C. ..	—	260	1,000	320	—
at 1,093 deg. C. ..	—	145	510	1,000	650
at 1,260 deg. C. ..	—	—	—	—	125
at 1,378 deg. C. ..	8	18	110	25	20
Hot deformation at 1,315 deg. C. (in. per in.) ..	—	—	—	—	0.034
Expansion at 1,093 deg. C. (in. per in.) ..	—	—	—	—	0.040

* 12 min. soaking period at temperature.

Control testing for green-sand properties of facing sand is carried on by all the foundries. The frequency of the testing varies from one test per working shift to making a test on each mill mixture. About 20 per cent. of the production foundries carry on the testing of every batch. Some foundries have set up their control testing requirements on the ½-, 1- or 2-hour basis; only a minority of foundries make such infrequent tests as one or two per day.

Reclaiming Facing Sand

Approximately 40 per cent. of the foundries considered produce large castings in green-sand moulds prepared from a facing sand consisting of reclaimed sand, in part or *in toto*. A few foundries employ a facing sand made up of used sand without reconditioning and new sand. Under such conditions, the used sand is screened and then mulled dry for one to two minutes prior to making new additions. The use of all reclaimed sand for green-sand moulding is possible because of the development of efficient reclamation units. Some foundries find that they must add new sand to the system to maintain sufficient sand for daily moulding purposes. Others find that it is not necessary to add new sand to the facing and the new sand comes into the system through the use of new sand in the core mix. In such cases, used sand is used without reconditioning in the mix, together with reclaimed sand. Examples of the various mixtures for reclaimed sand facings are given in Table VI.

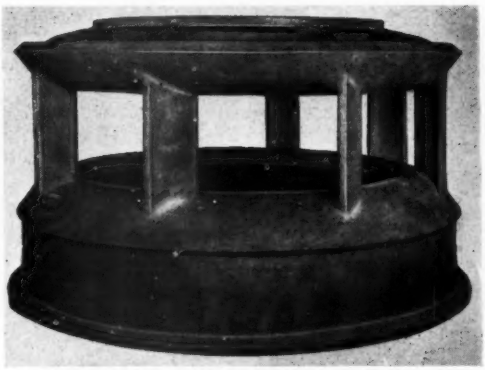


FIG. 4.—*Speed ring for hydro-electric power plant, weight 6¼ tons—Commercial Steel Castings Company.*

The reclamation methods employed are of two types: (1) wet reclamation and (2) dry, pneumatic reclamation, these being used about equally by the foundries reviewed in this study. Both methods, when operated properly, produce well-scrubbed, clean sand. Control testing for "green" properties is carried out very much in the manner reported previously. If statistical quality-control testing is practised in the foundry, every fifth batch would record sufficient variation if such variation existed. Only a few foundries make the more detailed sand tests for high-temperature properties. Table VII gives information on four reclaimed sands used as facing sands. It should be also pointed out that the hydrogen-ion concentration (pH) is tested in the control system of a number of foundries on the reclaimed-sand mix. Here, sodium carbonate is dissolved in the added water so as to keep the mix between 7.8 and 8.3 pH.

All-purpose Sand

Four of the steel foundries producing large castings in green-sand moulds prepare an all-purpose sand which is used as both a facing sand and a backing sand. The advantage of an all-purpose sand is that the Sandslingers and moulding units use only one sand and can sling a hard surface against all parts of the pattern. Otherwise, the facing has to be shovelled on the pattern and rammed with a pneumatic hammer. Beside being a faster method of mould production, the use of an all-purpose sand requires the use of only one sand-distribution system in the shop and the preparation of only one sand. Therefore, greater time and

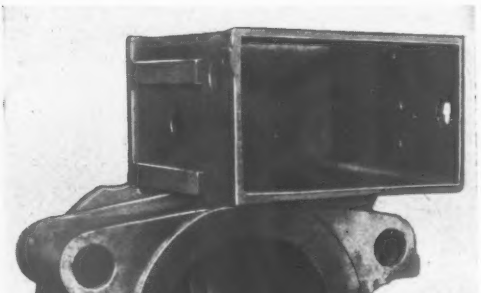


FIG. 5.—*Hydraulic press cylinder, with oil reservoir cast integrally, weight 4½ tons—Commercial Steel Castings Company.*

attention can be devoted to the control of this sand. Examples of all-purpose sand are given in Table VI (mixes, 2 and 5) and Table VII (mix, U.).

Backing Sand

All the foundries reviewed, other than the four that adopt an all-purpose sand, employ a backing sand which is used sand (heap sand); most of the foundries screen and mull the sand prior to its use for this purpose. For the most part, backing sands are prepared to either a green compressive-strength range or to a moisture-content range. The average green-strength of these sands will be about 6 lb. per sq. in. and a moisture content of 3.5 to 4.2 per cent. will usually suffice to develop the desired plasticity and green-strength.

Bentonite additions to the backing sand are usually low and will average from 0.5 to 1.0 per cent.; in some cases, additions of bentonite are seldom made at all. The reason for this condition is that the facing sands contain sufficient bentonite to produce, in some cases, green-strengths of upwards of 9 to .10 lb. per sq. in. and when these sands are re-used, they develop green-strength of 6 lb. per sq. in. without any additions other than perhaps water. In some cases, small amounts of cereal (0.2 to 0.4 per cent.) are added to the backing sand to improve their workability and to keep the sand from drying out too quickly.

Backing sands usually show permeability values from 100 to 170, and green-deformation values of 0.020 to 0.035. Testing control varies from once a day to once an hour, with an average value of control tests being taken four times daily.

Milling Conditions

The batch size used in milling green sands for large steel castings varies from 700 to 4,000 lb., but a majority of the foundries employ a batch size of 1,400 to 1,700 lb. The order of additions during milling varies somewhat, but by far the greater majority of foundries (28 out of 33) employ the following order in making additions: (1) sand; (2) silica flour, if used; (3) bentonite; (4) clay, if used; (5) cereal binder; (6) other dry ingredients such as iron oxide, wood-flour, pitch, sulphite liquor, etc.; (7) water. In most cases, the dry materials are mulled from one to two minutes dry, prior to adding the water. The minority group of foundries vary their additions by putting the water into the mill early. In three cases, a part or all of the water is added to the mill first and then the sand is added and milling proceeds. The remainder of the water, if any, is added after all the other ingredients have been added. The other two foundries add the sand and silica flour, if needed, and then make the water addition.

The reasons for these two major variations are that the majority group believes that it is necessary that all the dry ingredients be well mixed and proportionately distributed throughout the mixture before the water is added. The other group is of the belief that milling is the operation which results in close packing of sands and since the water-films around the grains play such an important part in the close-packing arrangement, it is advisable that the water and sand be added together. Close-packed sands are more resistant to metal erosion. Some recent studies on clay-film thicknesses and clay: water ratios have shown important effects on the casting-surface evaluation.

TABLE VI.—*Examples of Various Types of Reclaimed Facing Sand.*

	(1) Used + New.	(2) Used + Reclaimed.	(3) Used + Reclaimed + New.	(4) Reclaimed.	(5) Used + Reclaimed + New.
Used sand without reclamation, per cent.	62.8	79.0	29.4	—	74.4
Reclaimed sand, per cent.	—	19.8	29.4	94.8	24.0
New sand, per cent.	35.2	—	29.4	—	1.0
AFS grain size No.	51	52	59	53	47
Bentonite, per cent.	1.7	0.9	2.4	3.5	—
Clay, per cent.	—	—	1.0	0.7	—
Cereal, per cent.	0.3	0.3	0.6	0.4	0.3
Silica flour, per cent.	—	—	7.8	—	—
Water, per cent.	3.2	3.8	4.5	5.0	—
Green-compressive strength, lb. per sq. in. (room temperature)	6.5	6.7	9.0	7.0	8.5
Green permeability No.	150	180	105	140	150

Milling times will vary, depending on the type of mill employed. Twelve foundries out of those considered employ the Speedmuller and the milling times range from 1½ to 3 min. the following being a typical cycle:

The milling time on standard sand mills will vary from 5 to 12 min. with an average at 8 min. About a quarter of this cycle is allocated to the thorough mixing of the dry ingredients prior to the addition of water.

Only 20 per cent. of the foundries have the necessary equipment which makes all additions automatically, based on a time cycle, but all would like to have this equipment, as it eliminates the personal errors. Seventy-five per cent. of the foundries add the ingredients by weight, the remainder use weight for some materials and volume for others. A few foundries use volume measurement exclusively. It is realized that the weight measure is the most accurate and the method to be preferred. In most cases (75 per cent.) water is metered.

A number of foundries have made an effort to control the temperature of the sand at the mill. Others have prepared large heap-sand storage facilities to control the sand temperature. However, 40 per cent. of the foundries record the temperature of the sand mix and through aeration control and water addition at the mill, they are able to lower the temperature of the milled sand. Also, eight foundries record humidity conditions at the time the mix is being made and the water content is varied. The sands dry out very little on humid days and, therefore, initial water content can be reduced. Forty per cent. of the foundries have their mills controlled by a timer; this permits the mill operator to maintain a definite cycle of additions and milling and such methods are, of course, most advisable.

Transport and Storage.

After it is milled, sand for moulding large castings is transported to the various moulding stations primarily (55 per cent.) by open boxes or buckets handled by the crane. The boxes usually handle from 50 to 90 cub. ft. of sand. One third of the foundries employ conveyor belts to move the sand by overhead means to feed hoppers. Slinging machines are also fed from the hoppers by conveyor belts. Some foundries move the sand by having battery-operated trucks to handle sand buckets. Others use bucket conveyors to the sand silos and then conveyor belts to distribution centres.

TABLE VII.—*High-temperature Properties of Used and Reclaimed Facing Sands.*

—	O.	P.	U.	Y.
Facing Mixture				
Used sand, per cent.	62.8	90.7	80.6	—
Reclaimed sand, per cent.	—	—	17.8	74.4
New sand, per cent.	35.2	—	—	—
Bentonite, per cent.	1.7	2.4	1.2	4.5
Fireclay, per cent.	—	—	—	3.6
Water, per cent.	3.2	4.8	4.3	4.5
Cereal, per cent.	0.3	1.0	0.4	0.5
Silica flour, per cent.	—	5.9	—	12.5
AFS grain size	51	46	49	50
Properties				
Green-compression (lb. per sq. in.) at 70 deg. F.	6.5	9.5	7.5	9.7
Hot compressive strength* (per sq. in.)				
at 260 deg. C.	75	—	—	—
at 537 deg. C.	100	270	—	—
at 818 deg. C.	400	860	—	350
at 1,093 deg. C.	110	460	—	740
at 1,378 deg. C.	5	50	30†	4
Contraction at 818 deg. C. (in. per in.)	—	—	—	0.005
Expansion at 818 deg. C. (in. per in.)	—	—	—	0.015

* 12 min. soaking period. † 2 min. soaking period.

On the moulding floor, sand is stored primarily in open boxes or in the slinger storage hopper. There is also some storage in feed hoppers and closed bins and, in a few instances, the backing sand is stored in heaps on the foundry floor. Approximately 65 per cent. of the foundries protect the stored sand from drying out either by using covered bins or by covering the container with wet burlap sacks. However, most operators admit that the wet bags are not too efficient and indicate that the sand mixture should be used as soon as possible and that the sand should not be permitted to be stored overnight.

Moulding

As might be expected, 85 per cent. of the foundries use Sandslingers for moulding large castings in green sand. Four foundries employ large

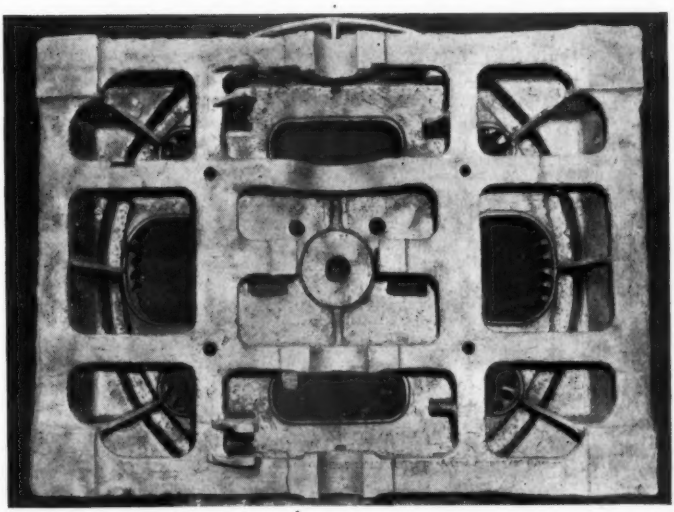


FIG. 6.—*Power-shovel base-casting, weight 2¾ tons. Commercial Steel Castings Company.*

jolt machines as well as Sandslingers and the other foundries employ sand fillers and ram the moulds with pneumatic hammers. Also, as previously described, most of the facing sand is placed on the pattern, rammed with pneumatic hammers and the backing sand added by Sandslinger.

The quantity of reinforcing bars and spacers employed per cub. ft. of green-sand mould varies greatly, depending on the weight of the casting and its length and complexity. Some operators estimate a use from 10 to 30 lb. of bars per cub. ft. of mould.

All foundries use scab-nailing of specified areas of large green-sand castings and about 88 per cent. employ large-headed nails at the ingate areas. The majority of founders lightly nail the cope surface at 1 to 6-in. centres depending on pattern design, such as variations from convex to concave. A few foundries do not employ nailing on cope surfaces, yet, on the other hand, in 25 per cent. of foundries, nailing of the cope surfaces is extensively employed. Drag surfaces are lightly nailed in the majority of foundries; but in 35 per cent. of foundries no scab nailing of the cope surface is practised; in over 50 per cent. there is no nailing on vertical mould walls; in others nailing is done as little as possible except when sections are very heavy.

Mould hardness, as determined by the indentation hardness tester, is set at a minimum of 70 for all mould cavities and values from 80 to 85 are normally obtained.

The maximum length of time that a pattern will remain in the mould being produced will, of course, depend entirely on the casting being produced. However, in some cases 100 to 150 hours have been required. Minimum times are from two to four hours. About 30 per cent. of the foundries are producing moulds which require the pattern in the sand more than eight hours.

Skin Drying and Mould Washes

Heat is used by 81 per cent. of the foundries to skin dry the moulds. Rather more than half of these foundries use portable hot-air circulatory dryers; the others use gas torches played directly on the mould surfaces. Those that do not employ heat either permit the mould to air dry for up to 24 hours after moulding, or pour the moulds "green" shortly after moulding is completed.

A mould wash is employed by 94 per cent. of the foundries on the large green-sand moulds. In most cases, the wash or coating is sprayed on the moulds and then the skin is dried. In some cases, a partial drying is undertaken before the wash is sprayed on and then the drying is continued and completed. The depth of the dried layer of sand from the mould face is about ¼-in. as a minimum and about 1½-in. as a maximum. Some drying extends above the 1-in. thickness but the gradation between only traces of moisture and the full moisture-content of the mix is fairly marked. The average depth of drying is about ¾-in.

A majority of foundries employ a proprietary wash purchased ready for use; only 33 per cent. of the foundries prepare their own wash. The proprietary washes are as follow:—

	Foundries.		Foundries.
Thiem-mould-lite ..	6	Silkote	1
Thiem-Krome-Koat ..	2	New Bond ..	1
Delta Special Core and mould wash.. ..	3	McCormick Super-wash	1
Delco Steel wash ..	2	Mabco-High Resist	1

Washes made up by the foundry are of two main types: (1) silica-flour washes and (2) a zircon wash. The silica-flour wash is produced from a mixture of silica flour, bentonite, cereal or resin, and water, and in some cases, alcohol is added. The zircon wash consists of zircon sand and flour, bentonite, and water. Some mixes will also contain "Delta Special" core- and mould-wash base; these washes are mixed to 45 to 55 deg. Baume.

In most cases, the moulds are given the skin drying before closing. However, in a number of cases the large moulds are set up for pouring and then dried by portable air-dryers. The moulds are usually poured when the mould skin is at a temperature below 100 deg. F. and in most cases, at shop temperature.

Cores

All the foundries reviewed use baked cores for the large green-sand moulds. Since the production of these cores follows regular practice, they will not be discussed in this report. However, 30 per cent. of the foundries also use green-sand cores in large green-sand moulds. Both green-topped cores and full-green cores are in use. Most of these foundries employ the same sand mix for "green" cores as they use for the green facing sand. Only three foundries have developed a special green core mix; these mixes are of lower green-strength than the facing sand; the primary difference in the mixture being a lower bentonite-content.

Half of the foundries that produce green-sand cores use them shortly after they are made and no effort is made to see that they are air dried. Two foundries air dry the cores for from one to two days; the remainder of the foundries skin dry the cores with torches from 30 min. to 3 hrs. These cores are usually large and a dry skin of ½ to 1 in. is desired.

About half the foundries that produce green-sand cores use a core wash, the others do not; the washes are similar to those used for the moulds. Green-sand cores are being used in some fairly large castings; for example, castings of upwards to 10 tons pouring weight with 18 to 20-in. metal sections. No trouble has been reported with this practice but it should be indicated that the cores were heavily vented. Also, it should be pointed out that a number of foundries are employing fast-drying oils (*e.g.*, Koldset) for large cores for large green-sand moulds. These cores are baked in the conventional gas-fired controlled-temperature ovens.

Difficulties

The main difficulty in the green-sand moulding practice for large steel castings is the same as for

almost any practice, namely, one of quality control. If all procedures are maintained within limits set, good results normally can be expected. One of the most important difficulties is failure properly to ram the moulds. If this is the case, the mould hardness is low and the moulds erode badly and produce castings with poor surfaces containing eroded sand. Two ways in which this condition can be overcome is to use slinging exclusively, with an all-purpose sand which can be used for a facing as well as a backing sand. Another method would be to have a divided reservoir on the Sandslinger and to go from new facing sand to backing sand at will by drawing from each feed bin as required. Some foundries indicate that there is difficulty with pattern draw and excessive pattern damage resulting from ramming to a rigid control of mould hardness at high mould-hardness levels of 85 to 90.

Another problem is that it is difficult to prevent moulds from drying out during the ramming and finishing operations on large moulds because of the time involved. The drying-out tends to produce friable mould surfaces that are difficult to patch. Such conditions often lead to sand inclusions in the casting face; improper procedures will result in scabbing and metal penetration. The condition is the result of improper sand preparation and control—sometimes sand-mill operators forget to put in the correct amount of silica flour in coarse-grained sands, with the result that metal penetration becomes a serious problem.

Skin drying must be controlled in all its phases, because in some cases, the large quantities of water-vapour given off cause defective castings unless the moulds and cores are extensively vented. It is the opinion of the founders using the green-sand practice for large steel castings that green sand offers no more difficulties than dry-sand practice provided controls are set and maintained. In fact, the foundries have indicated that they have been able to produce better steel castings with green-sand moulding practice than with any moulding practice they have used previously.

Advantages

The advantages of adopting green-sand moulding for large steel castings can be simply enumerated:—(1) Shorter moulding time in producing large castings because the long drying times are eliminated; (2) lower costs because of lower drying costs (production of built-up core moulds is costly and time-consuming); (3) good degree of mould accuracy because of a minimum of mould handling, and (4) less hot-tearing than in dry-sand moulds or built-up core moulds, therefore, less costly and time-consuming repairs. Costs and time are important considerations in moulding operations, hence the interest in the green-sand moulding of large steel castings.

THE Newcastle sales office of Brook Motors, Limited, moved to larger premises on January 8, 1957. The new address will be 6 Archbold Terrace, Newcastle-upon-Tyne (telephone: Newcastle 81-1003).

British Oxygen Practices

Nearly the whole of Britain's supply of oxygen and dissolved acetylene is accounted for by the British Oxygen Company, Limited, and its subsidiaries, says a report published last week by the Monopolies and Restrictive Practices Commission.

The Commission finds that "the conditions and things done as a result of, or for the purpose of preserving these conditions operate, and may be expected to continue to operate, against the public interest, unless changes are made and safeguards introduced." They draw attention to the danger to the public interest which exists where a large monopoly, such as BOC, has a substantial measure of control over the provision of plant and machinery for the production of goods which the monopoly sells. It is also stated that the company contract with the majority of its large customers lays down that they should take their total requirements of specified gases from the company, and that the company will provide and maintain any necessary apparatus on agreed terms, and that the customers will use the apparatus only in conjunction with gas supplied by the company. This requirement, it is stated, limits the customer's free choice to an extent which is against the public interest.

No evidence has been found to suggest that the company's efficiency fell below the standard which was expected. Referring to profits, the Commission says that considering the market conditions, post-war profits have been unjustifiably high for an almost complete monopoly facing a limited financial risk.

The Commission found that there is competition between the producers of propane with the future possibility of increased competition from other refineries. They found no evidence that prices have been fixed at a level which would yield excessive profits and have concluded that the conditions in respect to the supply of propane by manufacturers and distributors do not operate against the public interest.

BOC Comments

The British Oxygen Company, commenting on the findings of the Commission, state that the report comments favourably on the general efficiency of the company, in production, supply and technical service. The company believes this to be the reason for its present position in industry. Comments are made on prices and profits although on these points the Commission is divided. The company has found its earnings no more than sufficient to enable it to procure the capital, in the open market, necessary to maintain and develop its business under present-day conditions.

Overseas Challenge to UK Industry

A challenge to British industry to thrust forward in the race for the future development of the Commonwealth and the politically stable areas of Asia is the chief impression brought back by Mr. Lawrence Robson, chairman of Associated British Engineering, Limited, after his 34,000-mile world tour. The tour has "heartened and emboldened" him to pursue plans for development of the group's interests on a scale far beyond that which he would "have even contemplated" before.

Pilot schemes of great potential so that, following initial success, large-scale development would naturally follow, should be financed by British industry, Mr. Robson believes. Capital investment in the Commonwealth stimulated the flow of British exports, especially in engineering.

Commonwealth Standards Conference

Leading members from a number of British exporting industries are to attend the third (post-war) Commonwealth Standards Conference which opens in New Delhi on January 21. The main purpose of the conference will be to secure a common approach to, and greater alignment of, industrial standards among member-countries of the Commonwealth. Technical discussions will be held on standards for electrical equipment of machine tools, electric cables and steel, and on co-ordination of safety requirements for domestic electrical appliances. Consideration will be given to what standards most urgently need to be brought into alignment among Commonwealth nations.

The countries which will be represented at the conference are Australia, Canada, India, New Zealand, Pakistan, and the United Kingdom. The British delegation will consist of 25 representatives from the major British industries concerned and from the British Standards Institution. In general sessions, Mr. H. A. R. Binney, director of BSI, will be the delegation's principal spokesman. The Colonial Office will be represented by an observer, Mr. J. W. Norris.

General Matters

In addition to technical subjects, the conference will discuss standards matters of a more general nature, *e.g.:*

Metric and Inch Problems

This is an especially important subject because of the decision of the Government of India to change; over the next 10 years, to the metric system. The changeover will affect inter-Commonwealth trade as a whole and will necessitate the translation of inch standards into metric terms; for some industries, notably engineering, it is likely to involve some changes in the content of standards. Some indications have already been given by India of the way in which its standards will be adapted to the metric system. The Commonwealth conference discussions will, it is hoped, make clear which Indian standards will be significantly altered in substance by adoption of metric sizes in round numbers rather than by the precise conversion of inch sizes. In many instances, simple conversion is likely to be the rule and there will also be many cases where agreed international recommendations on preferred sizes expressed in metric units will be followed. There are likely to remain some problems for Commonwealth trade, where new metric sizes do not correspond exactly with the inch standards now being followed.

Approval schemes, ABC work, Modular Co-ordination, Certification Marking.

British exports to Canada of electrical equipment boilers and pressure vessels have been greatly assisted by the working of the BSI/CSA approvals scheme, by which products are inspected and approved in advance of shipment to make sure they conform to Canadian safety and other regulations. At Delhi, consideration will be given to the desirability of initiating such approval schemes, particularly for electrical equipment, between other Commonwealth countries.

Among other subjects to be discussed at Delhi will be the progress made in the co-ordination of basic engineering standards between the ABC countries (America Britain and Canada); modular co-ordination, for which delegates will have before them the first European Productivity Agency report on this subject as well as a report on development in India; and the problems arising from the growth of certification marking schemes —administration, inspection, testing, etc., and the legal protection of marks.

Light (Iron) Castings Industry in Scotland

By our Scottish Correspondent

During the past 12 months there was a considerable recession in the light castings industry in Scotland and it was in this section that the main unemployment in the Falkirk area has occurred. One of the contributory causes of this unemployment has been attributed to the lack of alternative industries. Several factors have caused this recession. Two of the main ones have been the Government's credit squeeze and the considerable falling off in the export trade. Due to this, many firms have been forced to introduce short-time working while at least one resorted to closing one of its foundries and as far as possible absorbed the labour from this into its other works. Since the start of the year concern has been felt in the area over this recession in the light castings industry for it has been more prolonged and heavier than at any other time since the war. The Chancellor's Budget brought in during the autumn and the further anti-inflationary measures taken during the spring have taken their toll in restricting home demand for light castings products.

In September it had been hoped that, with the summer trades and holidays over, it would be necessary for the industry in the area to be working to capacity in preparation for the forthcoming cold season, but, unfortunately, this did not materialize and nearly 300 workers remained on short time while more than 1,000 were unemployed in Falkirk, Grangemouth and Bonnybridge. Among the unemployed there was a high percentage of women, and the absence of suitable industry in the area in which they could be placed, it was extremely difficult to reduce their numbers to any appreciable extent. It is obvious that the light castings industry has been greatly affected by the post-war housing programme whereby the scheme was introduced of installing one fire per house—this causing a decline in the demand for cast-iron products which really made itself felt last year, there being the additional competition from pre-cast concrete for other uses.

The gas industry and those firms turning out baths and fitted goods have also been affected by the credit squeeze, the Australian market for baths having fallen away considerably. The drop in exports applies right through the trade and there appears to be no sign of any immediate revival in this respect. One bright spot concerns those firms manufacturing pipes and gutters, for they continued to be very busy. They all remained in full production and following a considerable amount of mechanization their output was considerably up.

The decline in the light castings industry in the Falkirk district has been the subject discussed at many meetings during the year and much blame has been attached to the Government for their failure to provide alternative employment or to prevent further decline. It has long been felt that a bigger Scottish machine tool industry would widen the market for castings.

"Flow of Metal" Film

The newly prepared film "Flow of Metal into Moulds" resulting from the activities of sub-committee T.S. 35 of the Institute of British Foundrymen, is now available for showing at meetings of the Institute. It is a 16-mm., sound film, running time 35 min., the recommended speed of showing being 16 frames per sec. Applications to reserve the film should be made to the secretary of the Institute.

New Year Honours

A number of people associated directly or indirectly with the foundry, iron and steel, and allied industries feature in the New Year Honours List. Details of some of the awards are given in what follows.

BARON

SIR ROBERT J. SINCLAIR, a former president of the Federation of British Industries (1949-51). He was a member of the Prime Minister's Advisory Panel of Industrialists (1939) and afterwards served as Director-General of Army Requirements, member of the Supply Council, member of the Army Council, chief executive of the Ministry of Production, and subsequently with the Board of Trade until November, 1945.

ORDER OF MERIT

SIR JOHN DOUGLAS COCKCROFT is the distinguished physicist and Director of the Atomic Research Establishment, Ministry of Supply, since 1946. He is 59 and was educated at Todmorden, Manchester University, and Cambridge. He was a Fellow of St. John's College, Cambridge, from 1928 to 1946 and Jacksonian Professor of Natural Philosophy at the university from 1939 to 1946. In 1941 he was appointed Chief Superintendent, Air Defence, Research and Development Establishment of the Ministry of Supply, and in 1944 Director of the Atomic Energy Division of the National Research Council of Canada. He is, *inter alia*, an honorary member of the Institution of Mechanical Engineers, honorary associate of the Manchester College of Technology, honorary member of the Institute of Marine Engineers, and, in addition to scientific distinctions, holds the honorary degrees of a number of universities. Sir John is a *Chevalier of the Légion d'Honneur* and the 1951 winner of the Nobel prize for physics.

KNIGHTS BACHELOR

DR. DAVID STIRLING ANDERSON since 1945 has been director of the Royal College of Science and Technology, Glasgow, the city at whose university he graduated in 1920, with special distinction in mechanical and electrical engineering, mathematics, and physics. He served a four-year apprenticeship with the North British Locomotive Company, Limited, Glasgow, and then was for six months with Fullerton, Hodgart & Barclay, Limited, engineers and ironfounders, Paisley. In 1930 he became principal of the Birmingham Central Technical College. MR. JOHN NORMAN DEAN is chairman and chief executive of the Telegraph Construction & Maintenance Company, Limited, and of Telcon Africa (Pty.), Limited, Telcon (Pakistan), Limited, and Telcon Telecommunications, Limited. MR. JOSIAH ECCLES, who is a member of the Institution of Civil Engineers, the Institution of Electrical Engineers, and the Institution of Mechanical Engineers, is deputy chairman (operations) of the Central Electricity Authority. After the first world war he joined Metropolitan-Vickers Electrical Company, Limited, and was with the company for six years before going to the Edinburgh Corporation electricity undertaking. He was president of the Institution of Electrical Engineers in 1954 and in 1949 chairman of the council of the British Electrical Development Association. MR. GEORGE ROBERT EDWARDS, who joined the design staff of Vickers-Aviation, Limited, Weybridge, in 1935 after seven years' general engineering experience, is now managing director of Vickers-Armstrongs (Aircraft), Limited. He was appointed in 1953, the same year that he was appointed a director of Vickers-Armstrongs, Limited. He became a director of Vickers, Limited, in 1955. MR. JAMES FREDERICK EMERY is a director of the Rugby Portland Cement Company, Limited, and of a number of other companies. He was MP for West Salford, 1935-45, and Mayor of Salford in 1932. COL. JACKSON MILLAR, chairman of Albion Motors, Limited, Glasgow, and a director of a number of other companies including Albion (Overseas), Limited, the Crittall Manufacturing Company, Limited, Leyland Motors, Limited, Scammell Lorries, Limited, Scottish Aviation, Limited; he is a member of the South-West Scotland Area Electricity Board. MR. WILLIAM LEONARD OWEN is director of engineering of the UK Atomic Energy Authority's Industrial Group. MR. FREDERICK JOHN PASCOE is chairman and managing director of British Timken, Limited, and the Fischer Bearings Company, Limited, and chairman of Aberdare Cables (Holdings), Limited. He is a member of the national council of Aims of Industry, Limited.

ORDER OF THE BATH
Civil Division
CB

MR. BERTIE KENNEDY BLOUNT, deputy secretary of the Department of Scientific and Industrial Research since 1952. After the last war, he was appointed assistant director of research to the Wellcome Foundation. He has worked with the Control Commission and the research division of the Military Security Board and from 1950 to 1952 was Director of Scientific Intelligence of the Ministry of Defence. MR. V. A. G. LAMBERT, Director-General of Armaments Production, Ministry of Supply.

ORDER OF ST. MICHAEL AND ST. GEORGE
KCMG

COL. SIR (ARTHUR) STANLEY ANGWIN, chairman of the Commonwealth Telecommunications Board since 1951 and formerly chairman of Cable & Wireless, Limited, and the Radio Research Board. He was president of the Institution of Electrical Engineers, 1943-44, and engineer-in-chief to the GPO, 1939-40. He was a pupil of Yarrow & Company, Limited, shipbuilders and engineers, of Glasgow, and is a Faraday Medallist.

ORDER OF THE BRITISH EMPIRE
Civil Division
GBE

SIR ARCHIBALD FINLAYSON FORBES, independent chairman of the Iron and Steel Board since 1953 and chairman of the board from 1946 to 1949 before the industry was nationalized. President of the Federation of British Industries from 1951 to 1953, Sir Archibald has served on a number of reorganization commissions and committees and as Director of Capital Finance to the Air Ministry, Deputy Secretary, Ministry of Aircraft Production, Controller of Repair, Equipment and Overseas Supplies, and the Aircraft Supply Council.

KBE

SIR CHRISTOPHER HINTON, a member of the board of the UK Atomic Energy Authority and managing director (Industrial Group) since 1954. He joined the

New Year Honours

alkali division of ICI in 1926 and was chief engineer from 1931 to 1940. During the last war he was with the Ministry of Supply.

CBE

MR. W. L. BAILLIE, director, Technical Personnel Administration, Ministry of Supply; MR. SIEGFRIED CAHN, managing director of Goodlass Wall & Lead Industries, Limited, and director of Associated Lead Manufacturers, Limited, Eyre Smelting Company, Limited, Fry's Diecastings, Limited, and Fry's Metal Foundries, Limited; MR. C. M. CAWLEY, deputy chief scientific officer of the Department of Scientific and Industrial Research; MR. E. L. CHAMPNESS, managing director of Palmers Hebburn Company, Limited, ship and engine repairers, etc., of Hebburn (Co. Durham); MR. A. A. FULTON, general manager of the North of Scotland Hydro-Electric Board; MR. A. T. GREEN, director of research of the British Ceramic Research Association; CAPT. (E.) W. GREGSON, chairman of the Fuel Efficiency Advisory Committee, chairman of Spencer-Bonecourt-Clarkson, Limited. He is a director of Erith's Engineering Company, Limited, and West's Gas Improvement Company, Limited. MR. HENRY RALPH HOUSTON, Deputy Chief Inspector, Mines and Quarries, Ministry of Fuel and Power, since 1953; MR. O. W. HUMPHREYS, director of the research laboratories of the General Electric Company, Limited. He is a member of the council of the British Non-Ferrous Metals Research Association, and the General Council and Executive Committee of the British Standards Institution. He also is a member of the British Nuclear Energy Conference and the Institute of Physics and a director of E.R.A. Patents, Limited, and Lumifax, Limited. MR. P. LLOYD, deputy director, research and development, of the National Gas Turbine Establishment, Farnborough; MR. W. W. S. ROBERTSON, chairman of the Eastern Regional Board for Industry; MR. E. J. STURGESS, chief engineer of the Shell Petroleum Company, Limited; LT.-CMNDR. J. W. THORNYCROFT, joint managing director of John I. Thornycroft & Company, Limited; MR. D. J. TURNER, Assistant Secretary, Ministry of Fuel and Power; CMNDR. HUGH LLOYD-WILLIAMS, Sub-Area engineer, London Electricity Board, and a member of the Industrial Court and Industrial Disputes Tribunal. He served his student apprenticeship with the British Thomson-Houston Company, Limited, and then joined the Metropolitan Electric Supply Company, Limited.

OBE

MR. F. E. BALL, principal scientific officer, Ministry of Supply; MR. WILLIAM BARR, technical director of Colvilles, Limited, director of Fullwood Foundry Company, Limited, and a member of the councils of the Institution of Metallurgists and the Iron and Steel Institute; MR. F. G. BREWER, secretary of the Gas Council; MR. J. W. CHRISTELOW, senior principal scientific officer, National Physical Laboratory, DSIR; MR. J. F. COATES, constructor, Naval Construction Research Establishment, Admiralty; MR. E. G. JAMES, leader of the Valve Group Research Laboratories of the General Electric Company, Limited; MR. H. KRONBERGER, chief physicist, Research and Development, British Headquarters Industrial Group, UK Atomic Energy Authority; MR. A. MATHISEN, managing director of the Graviner Manufacturing Company, Limited, non-ferrous founders, diecasters, etc., of Gosport (Hants); MR. A. J. PENN, chief engineer of the Aero Gas Turbine Division of D. Napier & Son, Limited; MR. E. W. PRIOR, principal, Ministry of Fuel and Power; MR. J. S. WILLIAMS, director of the Coal Utilization Council since 1949 and appointed chief executive in charge of organization last August; MR. H. K. WORSHIP, general manager of the Thorpe Road works, Norwich, of Laurence, Scott & Electromotors, Limited, manufacturing electrical engineers and iron-founders.

MBE

MR. J. H. BOWDEN, service manager, Mirrlees, Bickerton & Day, Limited, diesel engine manufacturers, of Stockport (Ches); MR. R. V. COOPER, secretary of the Institute of Plumbers, Limited; MR. W. C. CROPPER, group leader, research laboratories of the General Electric Company, Limited; MISS EDITH FRANCES DILBECK, senior executive of the British Iron and Steel Federation: MR. W. DRAKEFORD, works manager, Armstrong Siddeley (Brockworth), Limited, Gloucester; MR. C. H. EVANS, personnel manager of the Automatic Telephone & Electric Company, Limited, Liverpool; MR. T. J. FLUENDY, lately sub-Area Commercial Officer, Southern Electricity Board; MR. B. FULLMAN, chief information officer, British Non-Ferrous Metals Research Association; MR. H. I. W. GORDON, test house manager, Colvilles, Limited, Dalzell Works, Motherwell; MR. J. H. GRAY, senior mechanical designer draughtsman, W. H. Allen, Sons & Company, Limited, mechanical, hydraulic, and electrical engineers, of Bedford; MR. W. H. HOPKINS, works manager, Electric & Musical Industries, Limited, Wembley; MR. J. LINDSAY, chief generator erector, Bruce Peebles & Company, Limited, manufacturing electrical engineers, of Edinburgh; MR. F. E. B. LONG, welfare officer, staff department, Shell-Mex & B.P., Limited; MR. ALEXANDER MCKENDRICK, employer chairman, Lanarkshire District Advisory Committee, Scottish Board for Industry; MR. J. NAYLOR, manager, boilershop, Cammell Laird & Company (Shipbuilders & Engineers), Limited, Birkenhead; MR. G. F. OLIVER, deputy chief engineer, South-Western Gas Board; MR. C. W. PAUL, deputy manager, Harland & Wolff, Limited, Southampton; MR. G. J. K. SMITH, head foreman shipwright (steel), Swan, Hunter & Wigham Richardson, Limited, Wallsend (Northumberland); MISS MARY KAY WALSHAW, private secretary, Thos. Firth & John Brown, Limited, Sheffield. She succeeded in 1942 the late Mr. George Stanfield, as secretary to the committee of metallurgists formed in 1941 to co-ordinate and develop Britain's steel production, particularly in tank and aircraft armour. MR. W. WARREN, generation engineer (operation), East Midlands Division, Central Electricity Authority.

British Empire Medal

MR. W. A. BOSWORTHICK, assistant staff foreman, John I. Thornycroft & Company, Limited, Southampton; MR. P. BRADLEY, assistant manager, Hadfields, Limited, Sheffield; MR. J. A. COOK, maintenance engineer, Submarine Cables, Limited, Erith (Kent); MR. V. H. CROZIER, Vickers-Armstrongs, Limited, Barrow-in-Furness; MR. J. E. DOWNING, chargehand inspector, Ferranti, Limited, Oldham; MR. E. FLEMING, head foreman, Vickers-Armstrongs, Limited, Barrow-in-Furness; MR. F. J. GALBRAITH, manager, assembly shop, Seddon Diesel Vehicles, Limited, Oldham; MR. M. GEMMELL, boring mill operator, G. & J. Weir, Limited, Glasgow; MR. C. B. JAMES, centre lathe operator, Shelvoke & Drewry, Limited, engineers, etc., of Letchworth; MR. J. H. MATTHEWS, labour officer, Monsanto Chemicals, Limited, Newport (Mon); MR. A. W. ROWLEY, foreman, General Electric Company, Limited, Wembley (Middx); MR. R. SMITHERS, senior foreman, Cooke, Troughton & Simms, Limited; MR. F. WHITEHEAD, journeyman plater, Cochrane & Sons, Limited, shipbuilders, of Selby (Yorks).

SOUTH WALES SWITCHGEAR, LIMITED, manufacturers of switching equipment for electric power plant, have been allocated a 5,000-sq.-ft. factory at Carntyne Industrial Estate, Glasgow.

Return of Big Ben

*By P. N. Deas**

Thirty-three winters ago, Ben Moody toiled with his cumbersome equipment up the Albert Tower of the Palace of Westminster to the bell chamber of his namesake, Big Ben. There, engineer Moody's experiments with the crude microphones of the day culminated on February 17, 1924, with the first broadcast of the chimes of Big Ben. Regular broadcasts from that day until July, 1956, built Big Ben into the foremost radio and television personality in existence; one with a peak listening audience well in excess of fifty millions, scattered around the entire free world and in many regions behind the iron curtain.

Following the first complete overhaul in its 98 years of existence, Big Ben returned to the air on December 23, 1956, to resume its rôle as the audible symbol of the unity of all Britons, no matter where they be. Transmissions have been delayed until the departure of the last workmen from the range of the BBC microphones. The renovations and repairs they have completed are a vivid avowal of the continuing life of British engineering skill and craftsmanship. To the listening public, this is evidenced by the accuracy of the clock's time-keeping; it varies by less than a second from year to year.

Albert Tower

The exactitudes and beauty of its intricately designed roof and finial provide a thrilling picture of British craftsmanship to all who daily view with pride and affection the Albert Tower—Big Ben's official name. Few realize that this graceful, 102-ft. high summit to the Empire's hub is roofed with 100 tons of cast iron. The replacing of bomb-damaged roof panels and ornamental coats of arms provided an exciting challenge to the two companies in the Federated Foundries group chosen for this exacting work. It was essential that the original design should be rigidly adhered to, and in these two companies' employment are the scant score or so men born to and trained in the arts of this beautiful craft. It is they who have restored to Big Ben the perfection of form it showed on the morning of May 31, 1859, the moment it first went into service.

Cast-iron Roof

Choice of cast iron as a roofing material was no accident. The previous Palace of Westminster had been destroyed by fire in 1834, and the architect of the new one, Sir Charles Barry, decided there would be no repetition. Eighty years later, during world war II, Barry's intuition had an unexpected endorsement when many incendiary bombs fell on Big Ben and the rest of the Palace, only to ricochet harmlessly into the Thames or Parliament Square. Unquestionably a conventional roofing material would not have withstood the impact, and the result might have been the complete gutting of the Palace.

Big Ben's tremendously weighty roof necessitates special precautions at its base, and to prevent spreading the four corners are joined by a massive chain. During the war a bursting bomb broke one of the links. Robbed of the restraining influence of the chain the entire South face spread. Not the least difficult part of the repairs has been the making and fitting of oversize panels to the extended South face. The final bill for repairs to Big Ben and the clock tower is expected to be approximately £50,000.

Facts and Figures

Legend has it that Big Ben was so christened during a special sitting of Parliament to debate the name of their new, loud-voiced baby. Following a long and boring speech by the Commissioner of Works, Sir Benjamin Hall, a member rose and

FIG. 1.—*Part of the frieze of Coats of Arms (each of the latter weighs ¼ cwt.) on the Westminster Portcullis.*

* The Author, who is located at the London office of the Federated Foundries group, is the son of Mr. J. N. Deas, the present chairman.

FIG. 2.—*Section of the renovated cast-iron roof and one of the dormer windows.*

shouted " Let's call it Big Ben (Sir Benjamin's nickname) and have done with it." And so it was.

Work now completed by the 100-years-old Walter MacFarlane & Company, Limited, and Southern Foundries, Limited, (the two companies of Federated Foundries—one of Britain's largest group of ironfounders) includes a new frieze of coat of arms (Fig. 1), each weighing half a hundred-weight, in eight different designs, including the Tudor Rose, the Shamrock, the Thistle, the Leek, and combinations of the first three. These coats of arms have now been coloured, and it is hoped that they may be visible from the ground, which was not previously the case.

The roofs and ornamental work of Big Ben consist of over 2,750 castings (Fig. 2). Big Ben (the bell) weights 13½ tons; the clock face is 23 ft. dia.; the tower is 316 ft. high. Many recordings of its chimes have been made for playing in institutions all over the world. New Zealand's House of Representatives is one, and the Pacific National Bank at San Francisco another. The clock mechanism was designed by an amateur, Edmond Beckett Denison, Q.C., who was raised to the peerage as Baron Grimethorpe in 1886.

Other Work on the Palace

Details of other work which was done on the Palace of Westminster in general, by members of the Federated group, are contained in what follows.

It will be recalled that the House of Lords was destroyed by a high-explosive bomb during the war, and when this was re-built Federated was given the job of supplying and erecting the new cast-iron roof (Fig. 3). In addition the group replaced the entire north-west face of the Palace, which included many of the dormer windows. They are one-piece castings, and, as can be imagined, represent quite a complex piece of moulding.

The firm was also given the task of replacing the damaged parts of the roof of the Victoria Tower at the Battersea end of the Palace, and in addition restored the four spiral cast-iron staircases which run down inside the four turrets of this tower. The beautiful entrance porch of St. Stephen's chapel is also roofed in cast iron, and Federated made the ironwork for this, although they did not actually do the erection.

A JOINT SYMPOSIUM on the " Scaling-up of Chemical Plant and Processes," is to be held at Church House, Westminster, London, S.W.1, on May 28 and 29. It is being sponsored jointly by *Het Koninklijk Instituut Van Ingenieurs*, (chemical engineering group); *De Koninklijke Nederlandse Chemische Vereniging*, (section for chemical technology); the Society of Chemical Industry (chemical engineering group); and the Institution of Chemical Engineers. Thirteen papers are to be presented.

FIG. 3.—*View looking down on the Houses of Parliament, showing clearly the extent of the ironwork on the roof.*

Mond Nickel Fellowships

The Mond Nickel Fellowships Committee announced recently the award of two Fellowships for 1956 to the following applicants:—Mr. R. Bandy (English Steel Tool Corporation, Limited) to study in the United Kingdom, Europe and North America metallurgical research, production methods and quality control with respect to tool steels, and Dr. J. Hargreaves (United Steel Companies, Limited) to study the changes in design, construction and the methods of operation of steel making and processing furnaces which are being introduced in the United Kingdom, Europe and the United States to increase the rate and efficiency of production.

The Mond Nickel Fellowships Committee now invites applications for Fellowships of an approximate value of £900 to £1,200 for 1957. Fellowships will be awarded to selected candidates of British nationality with degree or equivalent qualifications to enable them to obtain wider experience and additional training in industrial establishments, at home or abroad, to make them more suitable for future employment in senior technical and administrative positions in British metallurgical industries. Each Fellowship will cover one full working year. Applicants will be required to state details of the programme they wish to carry out. Particulars and forms of application are available from:—the secretary, Mond Nickel Fellowships Committee, 4, Grosvenor Gardens, London, S.W.1. Completed application forms are required by June 1, 1957.

Railway Coach Contract

In the factory of the Pressed Steel Company, Limited, at Linwood, Renfrewshire, has been completed the first railway coach to be constructed in the new building of 120,000 sq. ft. specially laid out for this purpose. The company, which has already built 40,000 wagons for British Railways in the past six years, has obtained orders for 800 guards' vans and other coaches. These 60-ft. vehicles are built to British Railways specifications, and will be completed at the rate of ten per week; the value of the contract runs into several million pounds.

Extra staff have been engaged, bringing the total number employed to fully 2,000. Because of the production techniques employed, Pressed Steel are in a favourable position to take part in the British Railways schemes of modernization and to build passenger-carrying coaches. The Linwood contribution to British Railways wagon-building programme amounts to about one-third of the number of wagons built by private firms. The main production line is 16-ton mineral wagons, which are produced at the rate of 280 per week. A successful export business has also been built up in face of world competition, notably from India and Australia.

"Gas at Work in Industry"

As recently announced in the JOURNAL, there is to be an exhibition of "Gas at Work in Industry" at the Royal Horticultural Hall, London, S.W.1, from January 22 to February 2. This promises to be of real interest to founders as it represents a combination of typical productions and plant designed for their use. Thus there are stands devoted to shell moulding; to metal melting; infra-red radiant heating; space heating; catering; industrial burners; and a wide range of instruments. Details are available from the four area gas boards—North Thames, South Eastern, Southern and Eastern.

"Long Life" Firebars

A high-chromium type of heat-resisting steel, "Vesuvius," has been developed by Firth-Vickers Stainless Steels, Limited, for use at elevated temperatures because of its resistance to scaling at temperatures up to 1,100 to 1,150 deg. C. This steel is now being extensively used, for instance, for cast firebars for sintering plants which, used in conjunction with blast furnaces, convert the "fines" of the lower-grade iron-ores into usable form. Firebars of the new steel have a long working life and in one motor-car works

FIG. 1.—*Comparison of high-chromium alloy firebars (stamped "FV") in the "as cast" condition and ordinary cast-iron bars after the same period of use.*

have been found to have an average life of 1,800 days' continuous service compared with the 80 days of other types of steel. At another works, the number of bars changed weekly in the sintering plant has been reduced from 3,000 to 300 since the introduction of the new material (Fig. 1). Although the initial cost of "Vesuvius" firebars is higher than that of other materials, it is claimed that this is more than offset by their length of life and the consequent reduction in maintenance costs.

RSA, Offer of Endowed Prizes, 1957

The Royal Society of Arts, as Trustee for the undermentioned endowments, offers the following prizes during the year 1957:—*Howard Prize of* £50 *for Mechanical Motive Power:* The Howard Trust was established in 1868 for the purpose of making awards periodically to the authors of treatises on steam or other motive agents, and a prize of £50 will be awarded to the author of a treatise on some aspect of the subject of motive agents. *Fothergill Prize of* £20 *for Fire Prevention or Fire-fighting:* Under the Fothergill Trust (established by the Will of Dr. Fothergill in 1821) a prize of £20 is offered for a descriptive essay or model embodying some new idea for the prevention or suppression of fire. General conditions of entry may be obtained from the secretary of the Society, John Adam Street, Adelphi, London, W.C.2.

EMPLOYEES of Bairds & Scottish Steel, Limited, contributed £1,036 to charitable institutions during 1956.

Clean Air Provisions

Certain provisions of the Clean Air Act, 1956, came into operation on December 31. They included the provisions enabling local authorities to create smoke control areas, in which the emission of smoke from buildings will be an offence. Local authorities are able to create these areas by Orders which will be subject to confirmation by the Minister of Housing and Local Government.

A number of other changes made by the Act also came into force on December 31. All new furnaces, other than small domestic boilers, must be, so far as practicable, smokeless. Notice of intention to instal such a furnace must be given to the local authority. The Minister is empowered to make regulations requiring furnaces to be fitted with smoke-density meters. The height of new chimneys, other than those of houses, shops, and offices, requires approval by the local authority.

Local authorities may make building by-laws requiring the provision in new buildings of such arrangements for heating and cooking as are calculated to prevent, so far as practicable, the emission of smoke.

A similar Order has been made by the Secretary of State for Scotland. The remaining provisions of the Clean Air Act, which deal with the prohibition of dark smoke, and the reduction of grit and dust from industry, will be brought into operation at a later date.

Smokeless Zones

In a memorandum to local authorities the Ministry of Housing and Local Government states that it is contemplated that in the larger towns smoke control will be undertaken in gradual stages over a period of years. Progress will be governed by the supply of smokeless fuels, by the rate at which fireplaces can be converted, and by the speed with which local authorities are able to formulate and carry through their plans for smoke control. In total there will be enough of the various smokeless fuels in the next few years for a substantial start to be made. The memorandum stresses the importance of consultation between local authorities and the producers and distributors of fuel. The Minister of Fuel and Power is setting up advisory committees of producers and distributors to help in dealing with problems of smokeless fuel supply.

In smoke control areas, grates and other appliances in which smokeless fuels cannot be burnt satisfactorily will have to be altered or replaced. In houses, except those started after July 5, 1956 (the date on which the Act was passed), 70 per cent. of the cost of the necessary adaptations, as approved by the local authority, will be borne by the local authority and the Exchequer. Local authorities will also be able to make grants towards the cost of adaptations in churches, chapels, and charitable institutions. The memorandum recommends local authorities before making a smoke control order to carry out a detailed survey of the area concerned and to seek public co-operation by house-to-house visits, public meetings, and exhibitions.

Anglo-Polish Trade Arrangements

Negotiations between the Governments of Poland and the United Kingdom resulted in the signing of trade arrangements in Warsaw on December 31; these provide a basis for trade until the end of 1959 and permit the purchase of United Kingdom goods, including machinery, motor cars, and substantial amounts of mining equipment.

Law Cases

Uneven Floor Blamed

Before the West Bromwich County Court on December 19 was L. Cherrington, of Oldbury, who was claiming damages from the Incandescent Heat Company, Limited, Smethwick, Judge R. H. Norris reserved judgment.

It was said that while Cherrington, a shotblaster, was trying to prise free a 30-cwt. casting which had wedged against the side of the shotblasting cabinet, he sustained a double rupture. Mr. R. C. H. Briggs, for plaintiff, said that the casting was trundled to the cabinet on a trolley, which had to be man-handled over the uneven concrete floor of the foundry. At the cabinet it had to be pushed up a small steel ramp because the foundry floor was about two inches lower. A large casting of that type had to be dealt with about once a fortnight. It was extremely difficult for the casting to be pushed into the cabinet without it fouling the side. When it jammed, the method used to release it was to insert a crowbar between the front corner of the casting and the side of the cabinet and ease both casting and trolley backwards. It was then pushed forward again into the cabinet. On March 30, 1955, Cherrington was attempting to free one of the castings when he felt a pain in both groins, the bar slipped and he fell. Since the accident, a set of rails had been installed.

Cherrington told the Judge that he had worked at the firm for nearly six years. About eight men were pushing the trolley on the day of the accident. As he put his strength behind the crowbar, he felt the pain and released the bar. He had used the crowbar in a similar way on previous occasions. E. E. Smith, a foundry dresser, of West Bromwich, said that the floor of the foundry was uneven, with holes here and there, but since the accident it had been "done up" and the rails were provided. One man was able to push the trolley now. In the past it had been a difficult task. The only witness called by the defendant firm, E. A. Holman, foundry superintendent, of Dudley, agreed that there used to be holes in the foundry floor, but said that they were of a minor nature, nothing of any depth. In his opinion, it would have been possible to have used an overhead crane, which was about 10 ft. away, to pull out the trolley when the casting had become jammed in the doorway of the shot blasting cabinet. Mr. F. Blennerhassett, for defendants, submitted that there was nothing inherently dangerous in using a crowbar, and that no negligence whatever had been established against the firm. Mr. Briggs submitted that the accident was something that could be foreseen, and that the railway system should have been installed earlier.

Molten Metal Accident

Damages for £1,250, which included £128 special agreed damages, were awarded at Staffordshire Assizes at Stafford on December 12, to Ernest Aquila Thomas (54), an employee of Priorfields Foundry Company, Limited, Ettingshall, who was injured in August, 1953, in a dash for safety when molten metal escaped from a ladle. Thomas, who with other operatives, ran for safety when molten steel began leaking from a ladle after a mould had been filled, tripped over a compressed-air pipe and fell on to two valves. Giving judgment for Thomas, Mr. Justice Byrne said the evidence established in his mind the fact that in the foundry the company was experimenting with steel casting. The company had been proved to be negligent and it was due to their negligence that the molten metal was permitted to escape on to the floor.

Cupola Experiments*

Discussion of the Paper by K. G. Harris, B.Sc., A.I.M.

Most of the comment when the Paper of this title was presented at the Cardiff conference of the Institute of British Foundrymen was concerned with the carbon lining installed in the cupola. In this respect, lining erosion and profile; the selection of carbon for the purpose, and means of preventing burning away were discussed. Other comment included a contribution describing a novel procedure of cupola bricking without cement—even in the well; difficulties with skip charging; optimum charge: air-supply ratios, and the potentialities of hot blast or oxygen enrichment of the blast.

MR. D. FLEMING, complimenting Mr. Harris on the information contained and on the immense amount of work that was behind the Paper, said he would confine his remarks at this stage to a particular point in which he was interested. In Fig. 6, showing the carbon-brick lining, most of the wear was shown as occurring above tuyere level and some a little below the tuyeres, and on the diagram, erosion in the well was virtually absent. Had the Author in fact found that to be so? In other words, was it possible to estimate the life of carbon in the well only as from one course below the tuyeres downwards?

MR. HARRIS replied in the affirmative, and said the diagram shown in Fig. 6, perhaps tiedied up a little, was actually what had been found after running the cupola for the two days.

Carbon-lined Well

MR. FLEMING then asked whether the Author would like to make any estimate as to the possible continued life of that section.

MR. HARRIS said the organization with which he was connected was rather interested in putting in a carbon-lined well in their cupolas. However, the cupola in question, of course, was now a production cupola and hence he was not able to spend as much time experimenting with it as he would wish, but he certainly intended to put in a carbon well as soon as he could.

MR. FLEMING said he did not dispute the Author's reasoning as to how that particular contour was acquired, but his own experience had shown that the shape was naturally formed, and if one put in any other contour it would change to the one shown. It would give a better slope, and he had found the angle of slope and the behaviour at any given melting rate was linked up.

Using Bricks Without Cement

MR. GRIEVES said he appreciated the work which had been done but would like to make the suggestion for future work that Mr. Harris should cut out the use of cement between the bricks. He personally used the ordinary tapered firebricks and put them in place side by side, and the wear that took place was not between the joints but in the centre of the brick itself. His system had been in operation now for about three years. In the first cupola which had been modified in that way, the bricklayers had done the same in the well—that is, placed bricks without cement in that section also. At first he had been a bit worried about it, but the job had proved itself and now he continued to omit the use of cement in the well of the cupola. He was not too particular with the fit of the bricks, and did not mind if there was $\frac{1}{8}$-in. space here and there; there had been no trouble, no hot-spots, or anything of that nature, yet, of course, a considerable sum had been saved.

MR. HUGHES said it was always interesting to see someone attempt something novel in cupola operation, because it suggested other ideas to people engaged in such an operation, and that was what the lecturer had done. In his experience he had never found skip-charging of a cupola really to be satisfactory, particularly during the initial charging operation. Also, when it came to preparing a satisfactory coke-bed he had found—and his practice lent itself to it—that it was desirable to level-off the coke bed by hand in the normal way after putting, say, 90 per cent. of the coke in by skip. Furthermore, it had also been found desirable, for efficient cupola operation, to hand-charge the cupola in its initial stage. He thought the particular layout shown by Mr. Harris probably did not lend itself to that procedure.

Type of Carbon

MR. HUGHES said it seemed to him sometimes that people's minds were confused with regard to carbon. Was it amorphous carbon which had been used for the lining, or graphitic carbon, because the two materials were entirely different. The former was the cheaper of the two and the one that was more liable to lose through oxidation; the latter was more robust and would stand up to temperature changes much better. Experience he had gained in the use of carbon for lining the cupola well indicated that most of the erosion occurred after the cupola had been "dropped," and it occurred to a much greater extent with amorphous carbon than with graphitic carbon.

In connection with the Author's indication that he had introduced boost-coke charges between low-phosphorus and high-phosphorus metal charges, it would surely be desirable to reverse the order and put the high-phosphorus charges in first.

MR. HARRIS, in reply, said had they been able to put the high-phosphorus material in first it would

* Paper printed in the FOUNDRY TRADE JOURNAL, July 26, 1956.

have been all right, but the foundry was such that it was necessary to produce the low-phosphorus hematite metal out first, so it was not possible to charge the high percentage of engineering scrap during the early stages. The carbon bricks he had used were actually from the Cardiff blast-furnace plant and were mainly amorphous, partially graphitized. He believed, theoretically, a carbon brick graphitized in service at about 1,200 deg. C. in presence of iron and a not-too-oxidizing atmosphere. Probably the bricks were not in service long enough to graphitize to a sufficient degree.

As to cupola charging, he had already mentioned that a very simple baffle-plate had been put across the top of the cupola. One skip of coke was charged and its level checked with a rod, the baffle-plate was then inserted and then more coke in the position desired. Later, a man went up again with his rod to see if there were any "dead" spots. Thus, in effect, quite a lot of attention was paid to the levelling and the height of the bed coke above the tuyeres.

WRITTEN COMMENT

MR. R. C. SIDDALL wrote that in the paragraph on "Optimum Charge Weights" the Author stated: "*e.g.* an excessively high metal-temperature and low melting-rate indicated insufficient coke in the charge, with consequent burning away of the bed." One would have thought that it indicated the reverse, *i.e.* high metal-temperature and low melting-rate being caused by a too-generous coke-fraction. Could members have more information on this subject?

THE AUTHOR replied that he appreciated Mr. Siddall's comments which were, of course, correct, but explained that in the paragraph referred to he was speaking mainly on specific experimental work in which extremes of operating conditions were being investigated. In point of fact the coke and air were varied so much that in some cases the bed was practically burnt away, and it was invariably found that an abnormally high metal-temperature and slow melting-rate was an indication that the bed had passed the danger level, and the next iron down would be cold. This observation was employed in the trials to find optimum conditions.

Lining Wear

MR. T. A. COSH wrote that Mr. Harris had stated that the greatest amount of wear of the carbon lining occurred during the shut-down period, due to gaseous erosion. In consequence he hoped to lessen this wear by sealing off the cupola as much as possible. While sealing would improve the lining life it was not the complete answer. The low FeO-content of the slag when operating with the carbon lining indicated that operating conditions were more reducing than normal. Since no operational factors other than the lining were changed it must be concluded that this greater degree of reduction could only be brought about by a reaction between the oxidizing gases and the carbon lining above the tuyeres. Reduction of the extent of the oxidation zone immediately above the tuyeres could only be brought about by an increase in the thermal input through the tuyeres, that is to say, by means of hot blast. In this circumstance, a carbon lining with its consequent metallurgical advantages could be used with success. Alternatively, increasing the thermal potential by oxygen enrichment of the blast should produce a similar result, provided that a coke of good combustibility was used. On the subject of water-cooling, even the simplest system of water-cooling was worthwhile and beneficial, irrespective of the type of lining used.

MR. HARRIS replied thanking Mr. Cosh for his observations on the wear of the carbon lining described and confirmed that the reduction of the extent of the oxidation zone immediately above the tuyeres would be accomplished by an increase in the thermal input through the tuyeres. He himself would not be able to investigate hot blast in this respect, but the possibility of increasing the thermal potential by oxygen enrichment of the blast was one which he would seriously consider in the programme of further work.

125th Anniversary

Established in 1831, the well-known firm of Bradley & Turton, Engineers, of Caldwell Foundry, Kidderminster, celebrated its 125th anniversary last year. The occasion was commemorated at the Park Attwood, when the staff held their annual Christmas dinner, and the managing director, Mr. N. P. O. Bradley was presented with a silver salver and Stourbridge cut-glass decanter and glasses. The presentation to Mr. N. P. O. Bradley, was made by Mr. G. Davis, who will shortly have been employed by the firm for 60 years.

Mr. Davis, who can remember the original founder of the company, paid the highest tribute to the many improvements which have been made and which are largely due to the guidance and leadership of the present managing director. Replying to a toast to the firm which was proposed by Miss Sheila Corbett, Mr Bradley said in the past year a considerable amount of development had taken place in the production of semi-automatic and push-button control of hydraulic equipment, and although the indications were that 1957 may be a difficult year, he thought that the firm's experience and ability to manufacture these new machines would stand them in good stead in securing the share of the available markets for their products.

Sentinel Department Sold

The diesel-road-vehicle department of Sentinel (Shrewsbury), Limited—which was recently acquired by Rolls-Royce, Limited, from Metal Industries, Limited—has been bought by Mr. T. N. H. Ward, who is stated to be a director of North Cheshire Motors, Limited.

The department's spares, servicing, selling, and manufacturing rights will be taken up by a new company with the proposed title of Transport Vehicles (Warrington), Limited. This new company will carry out the same functions as the old one in every respect. The factory's 1,800 employees will probably be given other work within the Rolls-Royce organization.

Receivers, Tapping Systems and Slag Disposal*

Discussion of Sub-committee Report T.S.44 of the IBF Technical Council

The Report on this subject was presented at the Cardiff conference of the Institute of British Foundrymen by Mr. S. J. Sargood, chairman of the technical sub-committee which had prepared it. Discussion which followed was limited to a few points concerning details of cupola and tapping-system operation—amongst them being: Temperature loss of metal entering a receiver; difficulty of access to continuous tapping-boxes (and precautionary measures recommended), and possible trouble which could be experienced due to slag erosion of high sand-beds in basic-lined cupolas.

Opening the discussion, MR. H. G. HALL said he was particularly concerned with the section of the Report dealing with receivers; although it was very adequate, one thing for which he had looked he had been unable to find. Receivers generally seemed to be of two types: either the metal entered through a slot in the top or into a box at the side. There was no indication given in the Report of whether metal entry at the top of the receiver offered the possibility of much greater temperature-loss than when it was introduced into a short box at one end of the receiver.

A second request for information concerned possible difficulties associated with the tapping-box, as those shown in the Report appeared to be quite inaccessible. A third point queried was that in a cupola in which the metal was running continuously and slag separation was effected in the stream, there was no indication given as to whether one still needed a slag-hole for emergency purposes.

MR. SARGOOD, in reply, said in regard to the location of the entry of the metal into a receiver and the effect on its temperature of dropping it from a greater height through the roof, the sub-committee had not taken any measurements to determine the effect. In his own foundry, all three of the methods mentioned in the Report were in use on different furnaces and receivers and his view was that where the tonnage melted was over some ten tons per hour, the way in which it entered a receiver would not make any appreciable difference to its temperature. On small tonnages, however, a thin stream of metal falling from considerable height would suffer appreciable radiation losses.

Care with Tapping-boxes

It had to be admitted that a tapping system did require a fairly intimate knowledge (from a commonsense point of view) of the principles on which it operated, and care had to be exercised to ensure that the slag and metal passing through it were kept flowing freely. A good deal of practical experience had been built up during difficult periods, particularly during the war, for example, when furnaces were sometimes shut off for hours at a time. It had then been found that if a cupola with a continuous tapping-system (such as the Freier-Grunder) had to be shut off shortly after commencement of tapping, it had to be watched very carefully. It might be necessary to continue to blow the cupola and pass a small quantity of metal through it to prevent the tapping-box from freezing up; this procedure was much easier than trying to clear it if it did freeze. When the furnace had been running for an hour or two, it was quite practicable (when melting ordinary iron) to let it stand for an hour or so without any danger of freezing up in the tapping-box. It had been found that the best method of dealing with the problem was to insert a core in the front hole ("B" in Fig. 4 of the Report) after the flow had dwindled; the metal would then take some little while to reach the slag-notch level which was, say, 2-in. higher, dependent upon the system, and when it reached that level, the small quantity still coming down could be permitted to dribble over the slag notch. Prevention was better than cure when considering the freezing of tapholes: they could be cleared, but the exercise of a little commonsense and keeping careful watch should prevent any very serious difficulties. Although accessibility of the tapping-boxes illustrated in the Report was rather limited as compared with when intermittent tapping was adopted, correct maintenance and operation made it less necessary to have easy access.

As to whether a slag-hole was required in the well of the cupola for emergency purposes, he personally recommended that any type of cupola should be equipped with one low tuyere with, say, a lead plug, so that should the slag reach an undesirable level in the furnace, it would not cause difficulties at the other tuyeres. That provision was also important for all continuous tapping-systems although it was very rarely needed and no further precaution was necessary.

High Sand-bed

MR. D. FLEMING raised a query about cupolas having a high sand-bed. In the Report, it was said that unless a high basicity was required, a high sand-bed could be used in a basic cupola, but a reduction in desulphurization, and sometimes in carburization, ensued, and he would like to have a definition of "high basicity." In his own foundry, there had occurred two rather serious bottom run-outs from the cupola, and he believed what was actually happening in the high sand-bed cupola run basically was that quite a severe attack on the sand was occurring, leading to a reduction in desulphurization, and that it was only because of the deep bed that one could continue to melt without

* Report printed in the FOUNDRY TRADE JOURNAL, September 27 and October 4, 1956.

Receivers & Tapping Systems—Discussion

trouble. Was it, therefore, usual practice in a high sand-bed cupola used basically to adopt any form of coating for the bed? When his firm had first used a continuous tapping-box they had been worried on account of its inaccessibility, and had made what might be termed a "safety hole" in line with the main taphole.

MR. SARGOOD, in reply, said he could not see why the use of a basic slag should have any effect on a level sand-bed because with continuous tapping the slag, however basic, could only attack the sand-bed until the level of the sand-bed was reduced to that of the taphole, and it would then be covered by a layer of metal, which would effectively separate the sand-bed from the slag. Where basic slags had been used with sand-beds above the taphole level there had been attack above taphole level but not below it.

Basicity

With regard to permissible basicity, only slow erosion of high sand-beds had occurred above the taphole, provided the slag basicity did not exceed about 1.2. Desulphurization was adversely affected by a high sand-bed since a higher iron-oxide content remained in the slag. If in addition, sand was eroded, the resulting reduction in slag basicity led to a further reduction in the degree of desulphurization. With more-basic slags, the sand bed was rapidly eroded down to taphole level (but not further), and protection of the remaining bed was unnecessary. Protection of the high sand-bed was not very useful since the sand was sufficiently resistant to mildly-basic slags, and a high sand-bed was unlikely to be needed for strongly-basic slags. The latter were used for extensive desulphurization and carburization, both requiring a well of normal capacity and hence, precluding the use of a high sand-bed.

For accessibility, an emergency hole opposite the taphole could be added to most of the tapping systems dealt with in the Report, but this was considered unnecessary. Since the question of accessibility had been raised again, he would describe a different approach to the matter. An oxygen lance should always be available and if a blocked taphole could not be cleared in a few minutes, an emergency hole should be made above the original one so that metal and slag would flow into the top of the tapping-box, until, with continued melting, the taphole would clear and the emergency hole could be sealed. When the graphite mixture given in the Report was employed, an emergency hole could quickly be made with a bar, but if brickwork was used at that point, a sealed hole could be provided for emergency use.

MR. FLEMING agreed that as a general rule there was no risk of damage because there was a metal layer which held the slag and the sand bottom apart, but in the particular case he had mentioned previously, the sand bed was high at the back, furthest away from the taphole, and where the trouble occurred the slag bored a hole in the sand bed and for some reason the metal did not displace it. From a very careful study of the debris afterwards, he was fairly well satisfied that that was the explanation, and when the levels were altered the trouble had ceased.

MR. SARGOOD, in reply, said that in several years' experience of basic operation with a high sand-bed, no evidence could be found of any increase in the number of bottom run-outs experienced. There was one possible explanation of Mr. Fleming's difficulty, depending upon the method by which the sand-bed was put in. When preparing a high sand-bed it was necessary to ram thin layers one by one, but in the case quoted by Mr. Fleming the deep bed might have been rammed only on top.

The CHAIRMAN (Mr. H. J. V. Williams) thanked Mr. Sargood for presenting the Report and asked him to pass on members' appreciation to the other members of the sub-committee for the work they had done. Their Report would be used for reference purposes probably for many years to come.

Development Setback

The Planning and Development Committee of the Nuneaton Town Council has been informed by the Town Clerk that the County Plans Sub-committee had refused to grant permission for the development of 16 acres of land in Gipsy Lane as a site for a foundry proposed to be erected by the British Piston Ring Company, Limited, on the grounds that the land is outside the development area, that it is likely to be included within the future "green belt" proposals for the area and that other industrial land is available for development.

The Town Clerk stated that he had served the notice of refusal to give effect to the County Council's decision and had been informed by the applicants that an appeal against this decision will be made to the Minister.

The Committee resolved that it viewed this decision with regret and instructed the Town Clerk to inform the applicants that the Borough Council will support them on appeal on the grounds already submitted to the County Council.

Social Security Agreement

Reciprocal agreements on social security between the United Kingdom and the Federal German Republic have been signed. One agreement covers unemployment insurance and assistance, which will enable people who go from one country to the other to have their records of employment and insurance contributions in both countries taken into account if they become unemployed and have to claim benefit in either country. The other agreement covers all other National Insurance and industrial injuries benefits and provides for insurance in both countries to be taken into account when a person claims benefit under the scheme of either country. A Protocol on health services entitles people who go from the United Kingdom to Germany for employment, and certain groups of national insurance beneficiaries, to take advantage of the German health services in return for the facilities available to Germans in this country. The agreements will not come into effect until they have been ratified, when a further announcement will be made.

Notes from the Branches

Bristol and West of England

For the Bristol and West of England branch of the Institute of British Foundrymen, a new departure was made early in Octob by the holding of a meeting in Plymouth with a view to catering for the interests of branch members resident in Devon and Cornwall. The meeting was held at Glanville Street School, and Mr. H. Balme, a member of the branch Council, gave a paper on interesting foundry experiences and techniques. The audience, which comprised the majority of branch members from the Devon and Cornwall area, heard an interesting paper of an extremely practical nature, based on the lecturer's experience in the foundry over a number of years. Mr. Balme emphasized the necessity of appreciating and observing certain basic principles if foundry output was to be maintained successfully, and in particular spoke of devising running systems which would ensure the preheating of sections through which feed metal was required to pass when orthodox feeding methods were practised.

Some interesting questions, and answers, followed the paper. One member asked whether it was considered that rod feeding was actually responsible for the feeding of castings, or was the feeding actually obtained as a result of atmospheric pressure on the liquid metal continuously exposed as a result of rod feeding. In reply, Mr. Balme said that it was probable that a combination of both mechanical and atmospheric feeding took place, and that it was pointless to attempt rod feeding if insufficient feed metal was used, since with the minimum of feed metal, it would be difficult to ensure adequate "pumping" of metal into the mould cavity. It was interesting, said Mr. Balme, when considering the possibility of atmospheric pressure assisting feeding, that one usually encountered a prolongation in solidification of a casting when the runner or feeder head was accidentally bled after pouring. Replying to a question on the possible use of the "Connor"-type runner for feeding spoked-wheel castings, the lecturer said he did not favour this system as it was prone to influence the formation of hot spots—judicious use of chilling was more efficient in the production of sound castings, and at the same time, progressive solidification could always be assisted by the correct application of chilling. To another question, Mr. Balme replied that even when pouring large castings, successful feeding could be obtained by the use of pencil drop-gates without any material reduction in the pouring rate of the casting.

In proposing a vote of thanks, Mr. Holladay said that the paper had been one of real practical interest, and one which gave plenty of food for thought, a view which was also shared by Mr. F. K. Vickery who, when seconding the vote of thanks, said members were grateful to Mr. Balme for making his hard-earned experience so readily available to branch members.

Variety of Moulding Materials

The second meeting of the Bristol branch to be held in October took place at the Grand Hotel, Bristol, on October 27, when Mr. A. Tipper presented a paper on moulding materials available to the modern foundryman, and the use of these materials in relation to present-day moulding practice. Mr. Tipper reviewed each of the principal moulding materials from which founders could choose and critically reported on their specific limitations and applications.

Despite the comprehensive nature of this survey of the subject, many questions were put to Mr. Tipper. For the production of CO_2-treated cores, it was considered that core-shooters and coreblowers in general were suitable, but it was essential that these machines should be maintained at a high standard of cleanliness. In reply to a question regarding the most suitable type of mixing machines for sand preparation, it was confirmed that a mill was best for moulding sands whilst the conventional core-sand mixer was more suitable for core-sand preparation. It was always preferable, said Mr. Tipper, to use washed rather than un-washed sea-sand for foundry purposes.

Questioned as to the suitability of contour moulding for multi-part moulding boxes, Mr. Tipper said that at present there was little definite evidence regarding the application of this form of moulding technique for specific purposes. Replying to a question regarding the effect of section thickness on the surface finish of castings, the lecturer agreed that it was usual to find that thin-section castings yielded a better surface finish than thicker ones. Asked whether mixing times were critical for each type of sand binder described, Mr. Tipper said that mixing time was dependant upon the moisture content of a given sand mix rather than the type of binder. When the relative merits of liquid and powder binders were queried, the lecturer said that it was frequently a question of economics—it being necessary first to dry sands to be used with liquid binders—but he felt that better results were usually obtained by the use of powdered binders when careful control was exercised over the moisture content of the mix.

A member asked for advice as to how to prevent sand from sticking to patterns and coreboxes, to which request Mr. Tipper replied that especially in the case of wooden patterns cleanliness of the pattern was most essential. For coreboxes, it was often possible that softening of the varnish on the box was caused by the presence of alkalis in the sand mixture.

Proposing a vote of thanks, Mr. L. B. Gabb said that a large field had been very ably and thoroughly covered by Mr. Tipper, who had not only reviewed present practice but had also indicated the lines along which future developments could be expected to proceed, and he felt certain that all those present were grateful to Mr. Tipper for so excellent a paper. Mr. I. J. Birch, in seconding, endorsed these remarks.

November Meeting

A well attended meeting of the branch on November 17, again at the Grand Hotel, Bristol, enjoyed a paper by Mr. R. W. Ruddle on "Aspects of Casting Design," in which emphasis was laid on feeding systems, with special reference to the metallurgical factors affecting solidification. Throughout his paper, the Author emphasized how it was essential to effect a satisfactory balance between metallurgical and design factors if sound castings were to be produced.

Many questions were asked during the ensuing discussion regarding the merits of chilling and, in replying, Mr. Ruddle made the following points: Hot-spots in castings could sometimes be overcome by the judicious use of chills, but there was often a tendency to resort to too liberal use of chills, particularly on flanged sections, where well-balanced light chilling was often more beneficial than the use of isolated heavy chills. The hard ramming of moulds would often assist in promoting cooling and the production of sound castings. Questioned as to the possibility of porosity being due to gas inclusions, Mr. Ruddle said there was no evidence that gas penetration was responsible for porosity at re-entrant angles in castings, but it *was* possible that gas pressure could influence the formation of cavities.

Notes from the Branches

On the subject of the value of chilling for light alloys, Mr. Ruddle said that the indirect chilling of such alloys was not really effective. More satisfactory results were to be obtained by attention to the selection of moulding materials rather than to the use of chills.

One member wished to know the effect of ribs in a plate-type casting from the point of view of distortion. In such instances, it was considered that careful chilling of the reverse-side of the plate would assist in overcoming possible distortion.

Mr. H. Balme, in proposing a vote of thanks, said the paper had stimulated much valuable discussion, and the Branch was much indebted to Mr. Ruddle—a point echoed by Mr. D. A. Richards, when seconding. The latter added that it was a pity that no designers had been present to hear the paper, which was of equal importance to them as to foundrymen.

West Wales Section

At the December meeting of the West Wales section of the Wales and Monmouth branch of the Institute of British Foundrymen held at Llanelly, Mr. G. E. Parramore presented a Paper entitled "CO_2 Process in the Foundry." The lecture, which was illustrated with an excellent selection of slides, included some interesting information on the mixing of compressed air with CO_2 gas, the use of a cheap local dune sand, the use of graphite for chilling heavy sections, and metal-spraying of patterns. In the ensuing discussion Mr. Parramore made the following points: Some foundries are strickling CO_2 sand very successfully; hard ramming is necessary for large castings; there are no hard and fast rules for gassing, but over-gassing is often the cause of rough castings in grey iron; the CO_2 method costs more than green-sand moulding, but reduced machining costs sometimes justified its use; it was definitely advantageous for castings usually made by dry sand and loam methods; an addition of 1 per cent. Dextrine assists with collapsibility. The vote of thanks was proposed by Mr. B. Godber and seconded by Mr. T. Jones. Mr. R. S. Turner presided.

Power-station the Worst Offender

Atmospheric pollution in Scunthorpe arising from the electricity power station at Keadby and the steel industry is mainly responsible for a death rate in respiratory diseases there which is unsually large compared with the rest of Lincolnshire. Dr. Sidney Childs, Scunthorpe Medical Officer of Health, whose annual report for 1955 has just been published, bases his estimates on the consumption of coal in tons per month on similar lines to the Beaver Committee, and points out that while household fires produce more visible smoke than either railways or industry, the domestic smoke is spread over a much wider area and is never produced in such concentrated forms as other types. He says that the domestic fire is not very important as far as grit, dust and sulphur dioxide are concerned.

There continues to be a fairly heavy deposit of solids in the town according to tests taken at six different points. The largest amount of grit, dust and sulphur dioxide from the use of coal comes from the Keadby electric power station, with a much higher percentage than from the steel industry, the next biggest source. But this does not take into account the amount of grit and dust produced by the sintering, ore and slag crushing processes associated with the steel industry. These considerably increased during the year under review.

New Patents

761,482. Siegfried Junghans, Grabenstrasse, 2, Schorndorf, Wurttenberg, Germany.

Products made from rimming products steels. The material is produced from an ingot which during its formation in the mould, before formation of gas bubbles from the molten mass sets in, is subjected to a non-static magnetic field, and at the same time is chilled intensively. See also Patent No. 761,455.

761,491. Deutsche Edelstahlwerke, A.G., 578 Gladbacherstrasse, Krefeld, Germany.

Apparatus for the production of cores, shell moulds and the like for casting. The moulding material is shot into, or on to a corebox or mould, by compressed air from a shooting container adapted to be subjected to the pressure of compressed air. The compressed-air pipe introduced into the shooting container is directed towards a deflector constructed and placed so as to lie above the material when the apparatus was in use, and to spread outwards the compressed air discharged, substantially centrally on to it from the pipe and produce substantial uniform pressure on the material, while suddenly expelling it.

761,694. General Motors Corporation, Grand Boulevard, Detroit, Michigan, USA.

The formation of shell moulds or cores for use in casting metals. The method comprises applying to a heated pattern or corebox, a layer of resin/sand mix containing 1 to 4 per cent. by weight of a thermosetting synthetic resin binder, and then, with a die having a profile the reverse of that of the pattern or corebox, pressure is applied on the layer before curing. During this pressure exertion the thickness of the layer is reduced by 20 to 25 per cent.

761,750. Metro-Cutanit, Limited, Grappenhall, Warrington, Lancs.

Method of removing oxygen from oxygen contaminated material, comprising commercial transition metals of the fourth, fifth, and sixth groups of the periodic table, particularly titanium and zirconium.

761,843. Maerz Industrie-Ofenbau, A.G., 20 Claridenstrasse, Zurich, Switzerland.

An open-hearth furnace comprising a binding enclosing the heating chamber in the form of a framework supported on abutments and adapted to the outer shape of the heating chamber, at least some bricks, or groups of bricks, of the heating chamber being suspended directly on the framework.

762,030. Babcock & Wilcox Company, 161, East 72 Street, New York, 17, New York, USA.

Control systems for regulating the operation of continuous casting units.

762,058. Walworth Company, 430, Summer Street, Boston, 10, Massachusetts, USA.

A machine for casting by the shell-moulding method. It comprises a rotary carrier having radial arms, a loading station for the carrier, and a number of casting boxes mounted on the arms in end-to-end fashion forming a fixed rim portion of the wheel. In each casting box a completed shell-type mould is supported, spaced from at least one side of the casting box. The carrier can be moved to bring the casting box each in turn into the loading station. Here, granular refractory material is loaded into the space to back up the moulds (see also Patent No. 762,063, not abstracted).

Book Review

Metallurgy and Fuels. Edited by H. M. Finniston and J. P. Howe. Published by the Pergamon Press, Limited, 4/5, Fitzroy Square, London, W.1; price £7 7s., plus 1s. 9d. postage.

Under the general heading of "Progress in Nuclear Energy," a set of eight "series" of international papers is being planned for publication. Volume I of the fifth series dated 1956 is entitled "Metallurgy and Fuels." It consists of 32 papers grouped into nine chapters, revised and amplified by experts from the contributions made to the Geneva Conference of 1955. It will make the older metallurgist sit up and take notice; he may rub his eyes and wonder if there has been a mistake in the binding, for if he turns to Chapter 2 the heading is simply "Thorium," and Chapter 9 is "Solid State Physics." Chapter 6 is entitled "Ceramics," and if he expects to find therein something about pottery then one notes from the publisher's leaflet that "Ceramic systems are important as reactor fuels!" Thus, this chapter deals with the production by sintering of uranium-carbide tubes, and the manufacture of crucibles of uranium oxide and thorium oxide by slip casting. This is the sense in which fuels are dealt with.

In a foreword, Professor Cyril Smith states that the volume "well reflects the changes in metallurgy that have resulted in the last 15 years from the enforced contact with new engineering requirements on the one hand and with new ideas in physics on the other. Metallurgy is again an exciting subject." What has already been written in this review will inform the foundry metallurgist of the nature of the book, and that he will find in it nothing about oil burners or cupola coke.

The text provides straightforward reading for the ordinary metallurgist, and is well printed and illustrated. It is therefore a great stimulant, and one realizes the enormous hurdles which have been surmounted in the intense activity of these last 15 years. The determination and publication of 30 two-phase diagrams of uranium-alloy systems represents in itself a notable achievement.

The editing of the work must have been a considerable task, and likewise the preparation of the 18 pages of index. The latter is not free from imperfections, for there are to be found only three items listed under "Casting." One can turn up and learn about the vacuum melting and pot casting of beryllium, with its attendant porosity problems. The direct inductive melting of thorium and its vacuum casting into graphite moulds is described. "Residual radium isotopes escape from the metal and deposit on the interior of the furnace," thus producing health hazards. The casting of zirconium is listed as pp. 347-8, but it appears to start on p. 341. Uranium casting is not so indexed, but nevertheless will be found on pp. 40-44, whilst the melting and casting of dispersion-type fuel elements can be discovered on pp. 530-531. The book is packed with new data and the reviewer looked for the hardness value of the new element, plutonium. It is not indexed but will be found on p. 404.

These details are minor matters considering this monumental work as a whole, but since the price is high one wants the maximum access to the mass of information contained in this excellent volume.

H. O'N.

BORAX CONSOLIDATED, LIMITED, have announced that despite rising costs they will stabilize their prices in this country until March 31, unless exceptional factors intervene.

New Catalogues

Corrosion and Abrasion Prevention. The more one learns about rubber and its derivatives, the more fascinating the subject becomes. Publication No. 546/205A entitled "Anti-corrosion and Anti-abrasion," received from Silvertown Rubber Company, Limited, Herga House, Vincent Square, London, S.W.1, covers the use of rubber and ebonite linings for corrosion and wear resistance. Either separately or in combination, these materials are used to line wood, metal, concrete or brick structures, so that they may be useful for the storage of various chemicals. The notion of rubber-lined machinery has many possibilities, involving both reduced maintenance and noise. The opening paragraph of the booklet stresses that the firm's long experience is available to engineers as an aid to the solution of their problems, and it is suggested that readers should take advantage of this. The catalogue under review runs to 16 pages and is well illustrated. It is available to readers on writing to Vincent Square.

Electric Furnaces. Two catalogues have been received from Birlec, Limited, Tyburn Road, Erdington, Birmingham, 24. The first, No. 65/3, covers the Birlec "Detroit" rocking-arc melting furnace whilst the second, No. 76/3, deals with continuous-conveyor furnaces. It is the former which is of major interest to readers as it is a type which has gained some popularity in the foundry industry. It is a well-illustrated, twelve-page brochure and the engineering and metallurgical applications are well set out. The second brochure is noteworthy for the particularly neat background used for the illustrations—a factor the reviewer would like to impress upon those responsible for publicity in connection with foundries. Both brochures are available on writing to Erdington.

Oil-fired Metal-melting Installations. In instruction sheet No. 60 (2nd issue), the Morgan Crucible Company, Limited, Battersea Church Road, London, S.W.11, give full guidance to founders as to the installation of oil-fired melting plant. The text is clarified by the inclusion of layout plans for both ring oil-main and gravity-feed installations. These diagrams lose a little of their clarity through the use of captions in red type of too small a size. The data tables quoting fuel consumptions are particularly useful. The four-page pamphlet is available to readers on writing to Battersea.

Cranes, etc. From a catalogue received from Ransomes & Rapier, Limited, Waterside Works, Ipswich, it is learnt that a crane service is included with their four-purpose excavator equipment, which also carries out the duties of a dragshovel, shovel and skimmer. A second catalogue, beautifully printed, deals with walking draglines. The pictures of the plant in both catalogues are indeed impressive, especially those of the W.1400 model—claimed as the largest walking dragline in the world.

Soldering Aluminium Cables. Aluminium Union, Limited, the Adelphi, John Adam Street, London, W.C.2, have submitted an 84-page well-illustrated technical brochure covering the whole field of the soldering of aluminium cables, including a list of suppliers of all the necessary materials, and current rating tables. The catalogue is available *gratis* on request from the company at John Adam Street.

News in Brief

TWO-HUNDRED-AND-FORTY parents and their children attended the annual children's party of the building department of Hadfields, Limited, Sheffield, on January 2.

THE SPORTS AND SOCIAL CLUB of Samuel Osborn & Company, Limited, held their annual dance at the Cutlers' Hall, Sheffield, on January 4. Amongst those present was Mr. Frank Hurst, chairman of the company and president of the club.

FIRST STAGE of a development programme begun 12 months ago has just been completed by Richard Sutcliffe, Limited, at Horbury (Yorks). It includes the erection of a works extension, a research and development block, and a garage block.

THE INSTITUTE OF METALS has arranged for an all-day informal discussion on "Degreasing" to be held at the University, Edgbaston, Birmingham, on February 27, commencing 10.30 a.m. Visitors will be welcome and no tickets will be required.

THE 1957 FACTORY EQUIPMENT EXHIBITION, to be held at Earls Court from April 29 to May 4, already has a full quota of exhibitors. The exhibition will occupy 250,000 sq. ft. and the products and services of some 300 manufacturers, a number of them from overseas, will be on view.

OWING TO A FALLING-OFF in demand for motor-car parts, 35 foundry employees of the Belle Vale Works of G. Clancey, Limited, have been put on a four-day week. A spokesman said that a drop in exports made it a possibility that short-time working at the factory would have to be extended.

AT the annual dinner/dance of Marshall Osborne & Company, Limited, Don Works, Princip Street, Birmingham, 4, held at the Yenton Masonic Hall, Erdington, Birmingham, gold watches were presented to 18 employees and members of the staff in recognition of their 25 years' service to the company.

THE COMMISSIONERS OF CUSTOMS AND EXCISE, in consultation with the trade, on reviewing industrial built-up storage shelving and binning have exempted certain of this equipment from purchase tax. Details are available from the secretaries' office, H.M. Customs and Excise, King's Beam House, Mark Lane, London, E.C.3.

Mr. H. P. HUGHES, manager of the technical department of the British Electro Metallurgical Company, Wincobank, Sheffield, left for the United States on January 7, and will be there for approximately three months. Arrangements have been made for his staff to handle correspondence he normally deals with personally.

THE EXPORT CREDITS GUARANTEE DEPARTMENT announces that its West London office took over new premises at Romney House, Marsham Street, London, S.W.1 (telephone: ABBey 6271), on January 7. This office covers the London postal districts of N.W., W. and S.W., and the counties of Middlesex, Surrey, Sussex, Hampshire, Berkshire, Buckingham and Oxford.

THE FOUNDRY ENGINEERING FIRM of G. & J. Weir, Limited, are to supply equipment worth £1,500,000 for the biggest water-distillation plant in the world, soon to be built on the island of Aruba, in the Dutch West Indies. Switzerland will supply turbines and transformers, and the US, pumps, boilers and pipes. Most equipment will be British: the plant will cost about £3,500,000.

LAYCOCK ENGINEERING, LIMITED, Sheffield, are commencing the construction of a factory, costing £1,250,000, on a seven-acre site opposite their Victoria works. The first stage providing 65,000 sq. ft. of production space for the manufacture of railway air-brakes, garage equipment and other light engineering, is expected to be completed in 12 to 18 months. The total scheme provides for a floor area of 300,000 sq. ft.

"DEATH FROM INDUSTRIAL DISEASE" was recorded at a Sheffield inquest, on January 4, on a steel furnaceman, John Fox, who died from pulmonary thrombosis associated with pneumoconiosis. The widow said her husband had worked for Hadfields, Limited, for many years. He started as a crane slinger, but when he moved to the steel furnaces he began to have chest trouble and subsequently gave up work.

THE NETHERLANDS WELDING SOCIETY—Nederlandse *Vereniging Voor Lastechniek*—is again organizing an exhibition to take place from October 5 to 12. It will be held in the "Margriethal," one of the buildings of the Industries Fair at Utrecht, and during the exhibition there will be a two-day symposium devoted to the "Metallurgy of the Welding of Steel." Further information is obtainable from the secretariat, 62, Zeestraat, The Hague.

THE SECOND ANNUAL REUNION of retired employees of Callendar Abbots Foundry Companies, Limited, was held in the Callendar works canteen at Falkirk, recently. Mr. G. McLeod, works manager, presided and amongst others extended a welcome to 13 retired employees who were present. In all, 100 employees and their friends attended. Mr. R. G. Sinclair, managing director, presented gifts to the retired employees from the Benevolent Fund of the welfare section.

THE BRITISH TRANSPORT COMMISSION have placed a contract with Charles Roberts & Company, Limited, of Wakefield, for 38 railway tank wagons to be used for carrying creosote oil to British Railways creosote depots throughout the country. Each tank will have a capacity of 4,430 gallons. The wagons will be constructed with a long wheelbase—15 ft.—and will be equipped with vacuum brakes and roller bearings to enable them to run at the high speeds demanded by the modernization plan.

POLFORD ENGINEERING COMPANY, LIMITED, have transferred from Newcastle, and in future all correspondence and enquiries for the firm's foundry plant and equipment should be addressed to Bishop Auckland, Co. Durham (telephone: Bishop Auckland 41). Sales and service in England and Wales are controlled from Bishop Auckland, and the representative covering Lancashire, Yorkshire, Cheshire, Lincolnshire, North Derby and North Nottinghamshire is Mr. J. A. Hebden, 41, Nab Wood Crescent, Shipley, Yorkshire.

A MERGER is being arranged between Holman Bros., Limited, of Camborne, and Broom & Wade, Limited, of High Wycombe. The arrangement will strengthen the export business of the two companies which already amounts to over 50 per cent. of their joint output and it will enable the Holman factories in South Africa and Australia to assist in maintaining the equipment of both companies overseas. They will form a group within the British compressed-air industry of very considerable strength, which, in its sphere, should effectively counter world competition.

Mr. KEITH PEDLER, 19-year-old fitter-machinist of Adelaide, Australia, who was chosen as Australia's "Apprentice of the Year," has spent four days in Sheffield as the guest of the Sheffield Junior Chamber of Commerce. He has come to this country to finish his training, and is to visit a number of cities before

starting work in Luton and Bristol. In Sheffield he visited the works of Laycock Engineering Company, Limited, Samuel Osborn & Company, Limited, Walker & Hall, Limited, and the research laboratories of the British Iron and Steel Research Association.

ENGLISH STEEL CORPORATION LIMITED, held their annual staff dance at the Cutlers' Hall on December 28. Among those present (with their wives) were, Mr. F. Pickworth, chairman; Mr. W. D. Pugh, managing director; Dr. C. J. Dadswell, Mr. F. S. Beale, Dr. H. H. Burton, Mr. R. G. H. Taylor (directors); Mr. W. S. Scott (managing director of Darlington Forge, Limited); Major-General E. P. Readman (managing director of English Steel Tool Corporation, Limited); and Mr. W. E. A. Redfearn (assistant managing director of English Steel Forge and Engineering Corporation, Limited).

THE EAST MIDLANDS GAS BOARD has assured the Gas Consultative Council that "barring unforeseen happenings" there should be adequate supplies of gas available in the Sheffield area this winter. The Manvers coke ovens of the National Coal Board have now gone into commission, and new horizontal ovens at the Sheffield Neepsend gas works are expected to be working before the end of this month. They will provide 2½ million cub. ft. per day. On the completion of the scheme there will be a production of 10,000,000 cub. ft., but the net gain will be 6,000,000, as other plant is to go out of production.

THE president of the Royal Society, Sir Cyril Hinshelwood, has appointed the following vice-presidents for the year ending November 30, 1957:—Sir David Brunt, physical secretary of the Royal Society and chairman of the Electricity Supply Research Council of the Central Electricity Authority; Prof. G. L. Brown, biological secretary of the Royal Society and Jodrell Professor of Physiology at University College, London; Sir Claude Gibb, chairman and managing director of C. A. Parsons & Company, Limited, and chairman of A. Reyrolle & Company, Limited; and Sir Bryan Matthews, Professor of Physiology at Cambridge University.

Mr. ARNOLD LINDLEY, a director of GEC, has stated that, at the height of constructional work on the Hunterston (Ayrshire) nuclear power-station, generating capacity 360,000 kw, about 10,000 people would be employed. The station would have a permanent staff of 300. It has been designed by the GEC-Simon-Carves Atomic Energy Group with the GEC as main contractors. The erection programme will be assisted by a specially built crane which will have a span of 200 ft. and a lifting capacity of up to 300 tons. The nuclear furnaces in all the stations will be similar to the Calder Hall reactor—graphite moderated, gas-cooled; and they are due to be in operation in three and a half years.

IN HIS ANNUAL REPORT Mr. E. Percival Jenks, chairman of the Wolverhampton firm of E. P. Jenks, Limited, expressing disquiet that the Government is considering granting permits for the export of non-ferrous scrap, said "Our extrusion trade depends largely on the use of a certain proportion of scrap metal. There is at present a marked shortage of brass and copper scrap which curtails production and increases costs." Referring to the Government's proposal to grant export permits, Mr. Jenks says "When similar export was encouraged in the past the result to our national industry was almost disastrous; should similar conditions recur they would have an adverse effect on the non-ferrous extrusions trade generally with a seriously detrimental effect on the competitive export trade using extruded products."

AT THE DECEMBER LUNCHEON of the Non-Ferrous Club, held at the Queen's Hotel, Birmingham, on January 3, the guest speaker, Professor Gilbert Walker, Professor of Commerce in the Birmingham University, produced some interesting figures regarding the amount of fuel which is needed and produced by our country. To show how much the UK was affected by the fuel crisis in the Middle East, he said, that in 1954, 31 million tons of crude oil were imported to make up for the deficiency in coal, and it was, in his opinion, the iron and steel producers who would be the hardest hit as oil was their best fuel. At this luncheon a collection was taken on behalf of the Royal Metal Trades Pension and Benevolent Society which realized £15 5s. 6d. It was also announced that the annual general meeting would be held on March 14 and would be in the form of a domestic evening with no guests present.

Obituary

Mr. JAMES E. PERT, who has died at the age of 64, was a director of the Montrose Foundry Company and other undertakings.

The death is reported on December 26 of Mr. FRANK RUSHTON, a director of Brayshaw Furnaces & Tools, Limited, Manchester.

The sudden death, on December 22, is announced of Mr. F. H. CLARK, chairman and managing director of F. H. Clark & Son, Limited, manufacturers of piano-forte frames.

The death occurred on December 21 of Mr. REGINALD JOHN HAWKER, a director of the John Thompson (Instrument) Company, Limited. Mr. Hawker, who was 53, joined the company in 1937 and at the time of his death was, in addition to being a director of a subsidiary concern, chief electrician to the John Thompson group of companies.

Sir PIERCE THOMAS LACY, formerly one of Birmingham's leading stockbrokers, died on Christmas Day at the age of 84. In the early 1900s he was chairman of the Birmingham Stock Exchange and was also chairman or director of a number of well-known industrial concerns. For many years he was a director of the Metropolitan Carriage, Wagon & Finance Company, Limited, and he arranged its amalgamation with Vickers, Limited.

The death has occured of Mr. G. R. DANIEL, general manager of the Imperial Smelting Corporation, Limited, Avonmouth, Bristol. He was 64. Mr. Daniel was trained in the laboratory of the Mond Nickel Company, Swansea, which he left at the beginning of the 1914 war to join the Glamorgan Yeomanry. After being invalided out of the Army in 1917, he joined the Swansea Vale Works of the National Smelting Company as a technician. He became assistant works manager at Swansea Vale in 1926, and works manager in 1934. Thirteen years later he moved to Bristol, where he was appointed works manager of the National Smelting Company, which has its headquarters at Avonmouth. In July, 1952, he was appointed general manager of the parent company, the Imperial Smelting Corporation, and also had a seat on the board.

Imports and Exports of Iron and Steel in November

The following tables, based on Board of Trade returns, gives figures of imports and exports of iron and steel in November. Totals for the first eleven months of 1956 and 1955 are also included.

Total Exports of Iron and Steel

Destination.	Month ended Nov. 30.	Eleven months ended November 30.	
	1956.	1955.	1956.
	Tons.	Tons.	Tons.
Channel Islands	853	5,578	4,957
Cyprus	2,196	3,967	7,372
Sierra Leone	814	7,971	7,752
Gold Coast	1,649	21,381	21,345
Nigeria	3,835	44,383	49,065
Union of South Africa	5,994	60,953	62,993
Rhodesia and Nyasaland	4,005	61,283	73,136
Tanganyika	2,133	15,908	21,797
Kenya	3,225	42,180	39,913
Uganda	233	4,170	4,269
Anglo-Egyptian Sudan	1,203	15,977	12,444
Mauritius	320	2,219	3,464
Aden	306	6,937	4,879
Bahrain, Qatar, and Trucial States	589	11,189	9,855
Kuwait	856	4,409	7,755
India	24,027	138,432	274,269
Pakistan	9,550	36,443	54,968
Singapore	4,463	32,741	31,444
Malaya	2,505	22,624	31,669
Ceylon	970	15,679	25,909
British North Borneo	722	4,080	5,819
Hongkong	10,060	40,451	67,226
Australia	18,753	355,560	196,420
New Zealand	15,032	236,706	162,468
Canada	27,246	119,523	271,713
Jamaica	2,107	15,852	20,425
Trinidad	3,410	42,676	38,775
British Guiana	496	6,912	4,977
Other Commonwealth countries	2,821	22,216	26,702
Eire	4,285	53,737	59,479
Finland	7,530	65,208	56,416
Sweden	7,882	127,234	100,535
Norway	8,998	98,680	82,422
Denmark	8,180	70,839	72,008
Western Germany	669	10,545	8,378
Netherlands	9,858	88,976	83,750
Belgium	3,544	19,590	30,187
France	1,919	5,179	11,162
Switzerland	1,492	13,301	12,835
Portugal	1,188	12,117	9,659
Spain	1,338	56,248	26,032
Italy	1,725	23,858	16,009
Austria	719	2,877	4,484
Yugoslavia	1,486	12,601	7,876
Greece	684	7,176	5,411
Turkey	156	7,425	3,785
Netherlands Antilles	357	10,428	7,166
Portuguese East Africa	316	2,465	2,780
Lebanon	230	17,390	5,331
Egypt	512	19,785	35,417
Israel	144	10,706	6,779
Saudi Arabia	77	5,946	14,426
Iraq	1,408	39,230	26,349
Iran	3,615	67,568	57,773
Burma	975	9,729	8,015
Thailand	360	4,567	6,765
Indonesia	342	4,752	9,022
Philippine Republic	943	7,753	7,373
USA	9,850	47,258	61,923
Cuba	662	5,251	8,155
Colombia	393	5,010	4,514
Venezuela	6,336	58,007	62,085
Ecuador	199	3,408	3,761
Peru	888	9,476	15,096
Chile	351	882	1,819
Uruguay	1,811	6,118	6,453
Argentina	5,990	47,612	49,236
Other foreign countries	16,772	32,145	72,534
TOTAL	264,557	2,489,477	2,606,980

Total Imports of Iron and Steel

From.	Month ended Nov. 30.	Eleven months ended November 30.	
	1956.	1955.	1956.
	Tons.	Tons.	Tons.
Rhodesia and Nyasaland	511	3,292	3,468
Australia	242	67	881
Canada	3,646	118,372	56,209
Other Commonwealth countries and Eire	1,371	23,483	7,523
Soviet Union	34,060	200,519	272,024
Sweden	3,020	29,705	44,640
Norway	9,726	78,553	101,084
Western Germany	17,682	68,258	203,559
Netherlands	6,660	149,104	93,010
Belgium	12,789	187,658	334,205
Luxembourg	2,973	44,384	54,699
France	10,375	270,546	207,172
Italy	653	1,894	12,554
Austria	11,141	115,401	147,760
Japan	1,595	27,543	16,962
USA	10,108	697,825	379,506
Other foreign countries	1,366	35,332	64,944
TOTAL	127,918	2,051,936	2,000,200
Iron and steel scrap and waste, fit only for the recovery of metal	68,618	1,174,954	940,042

Exports of Iron and Steel, by Products

Product.	Month ended Nov. 30.	Eleven months ended November 30.	
	1956.	1955.	1956.
	Tons.	Tons.	Tons.
Pig-iron	25,545	45,284	130,612
Ferro-colombium (niobium)	15	55	143
Ferro-tungsten	85	561	1,025
Other ferro-alloys	476	3,111	4,070
Ingots, blooms, billets, slabs, sheets, and tinplate bars	132	3,685	1,812
Iron bars, rods, angles, shapes, and sections	234	3,172	1,954
Steel bars, rods, angles, sections, and shapes	45,075	401,647	425,316
Iron plates and sheets	19	151	463
Universal plates	37	8,452	3,205
Steel plates, ⅛ in. and under ⅜ in.	777	17,739	9,057
Do., ⅜ in. and over	16,461	241,106	206,199
Blacksheets and blackplate	24,752	203,766	213,483
Hoop and strip	7,624	94,418	80,800
Tinplate	28,458	288,812	278,678
Decorated tinplate	243	3,785	5,138
Galvanized sheets	24,458	149,960	144,652
Other (incl. tinned sheets, terneplate, and ternesheets)	1,371	13,078	12,869
Railway and tramway construction material	19,050	251,777	241,099
Wire rods	5,024	27,626	38,395
Wire	8,319	90,540	88,076
Tubes, pipes, and fittings	65,118	627,537	711,204
Iron castings	267	8,707	2,347
Steel castings	176	1,660	1,795
Forgings	841	2,848	4,588
TOTAL	264,557	2,489,477	2,606,980

BRITISH ELECTRO METALLURGICAL COMPANY, Sheffield, announce that the following materials are now no longer available: "Silvaz" MW mix and 85 per cent. molybdenum metal powder.

Mr. G. W. PRESTON, M.B.E., M.I.E.E., has retired from his position as general manager of the Copper Development Association. Mr. R. B. F. WYLIE, B.A. (Cantab.), has been appointed to the new position of director of the Association, whose headquarters are now at 55, South Audley Street, London, W.1.

Personal

Mr. F. COCKAYNE has resigned from the board of Enfield Rolling Mills, Limited.

Mr. W. J. M. ADAMS has been appointed managing director of Worthington-Simpson, Limited, engineers, Newark, Notts.

Mr. H. F. OSBORNE, director and general manager of Vokes, Limited, has been appointed managing director with effect from January 1.

Dr. S. F. DOREY, C.B.E., D.SC., WH.EX., retired from his position of chief engineer of Lloyd's Register of Shipping at the end of last year.

Mr. HAROLD W. I. REES has been appointed Midlands representative and Mr. G. C. COATSWORTH Glasgow representative of the Consett Iron Company, Limited.

Mr. NORMAN V. HOWARD and Mr. CHARLES W. HUTCHINSON have been appointed local directors of Thos. Firth and John Brown, Limited, steel manufacturers, Sheffield.

Mr. JAMES MITCHELL, who has recently celebrated his 79th birthday, is still working as a moulder with Wilsons & Mathiesons, Limited, ironfounders, Armley, Leeds, and has no present intention of retiring.

Sir SUMMERS HUNTER and Mr. HARRY HUNTER retired from the board of Richardsons Westgarth & Company, Limited, on December 31. Mr. J. E. SMITH and Mr. G. L. HUNTER have been appointed to the board.

THE MEDAL of the Society of Chemical Industry, which is awarded not more than once every two years for conspicuous services to applied chemistry or to the Society, has been awarded for 1957 to Dr. WALTER J. WORBOYS.

Mr. J. MCBRIDE, who has completed 50 years' service with Mechans Limited, Scotstoun Iron Works, Glasgow, has been presented with a certificate by the firm. Certificates for 30 years' service were awarded to 11 employees.

Mr. JOHN MIDGLEY has been appointed to the board of Carter Gears, Limited, Bradford, a subsidiary of Crofts Engineers (Holdings), Limited. He joined the company in 1948 and has been general manager for the last four years.

Mr. ERNEST SPRINGTHORPE, Mr. C. NORMAN BRADSHAW, Mr. ERIC WOLSTENHOLME, Mr. GEORGE PAGE, Mr. REG. HADFIELD, and Mr. ALFRED KISSACK have been appointed local directors of Thos. W. Ward, Limited, as from January 1.

Latest appointment to the board of George Cohen 600 Group, Limited, is that of Mr. FRANK ROWE, who, since 1943, has been managing director of one of the largest companies in the 600 Group—K. & L. Steelfounders & Engineers, Limited.

Mr. F. WILLIAMS will relinquish the post of works director of Markham & Company, Limited, this month, but will remain a member of the board. Mr. ARTHUR VAN RHEE has been appointed a director and will take over the post of works director.

Mr. C. E. EVANS, O.B.E., previously general manager of British Hydrocarbon Chemicals, Limited, has been appointed general manager of the Distillers Company, Limited, and Mr. D. Blair Watt has been appointed works manager at Grangemouth.

Dr. H. G. TAYLOR has been appointed director of the Electrical Research Association, in succession to the late Dr. S. WHITEHEAD, from April next. For the past nine years Dr. Taylor has been director of research of the British Welding Research Association.

Mr. C. S. DINGLEY has given up his executive position as sales director of B.I.P. Chemicals, Limited, but remains on the board. He will also remain a director of British Industrial Plastics, Limited, the Streetly Manufacturing Company, Limited, and B.I.P. Tools, Limited.

Mr. G. N. BRIDGE has been appointed a director of Associated British Oil Engines (Export), Limited, Brush Export, Limited, and National Oil Engines (Export), Limited, the export companies of the Brush group, of which he retains his appointment as London manager.

After nearly 39 years' service with the British Oxygen Company, Limited, Mr. E. S. LANE has retired from his post as Northern area sales manager of the medical division. Mr. Lane will be succeeded by Mr. FREDERICK B. STEPHENS, who is at present assistant area sales manager.

Mr. E. G. COATES, senior physicist with the Sheffield Smelting Company, Limited, has been appointed principal of the Wallasey Technical School, Cheshire. He is 45 years old and was previously full-time lecturer in physics at the Cheltenham, Derby and Nottingham Technical Colleges.

Mr. P. HOESLI, honorary secretary of the Slough section of the Institute of British Foundrymen, has changed his home address to 11, Raymond Road, Langley, Buckinghamshire. IBF communications should still be sent to him c/o British Non-Ferrous Metals Research Association.

Mrs. SINCLAIR, of the Allied Ironfounders' Angling Club, presented Mr. P. BUCHANAN with the Hill Cup and the 1st prize for 1956; the presentation was made at a social function at the Callendar Works, Falkirk. Mr. R. G. SINCLAIR, managing director, and Mrs. SINCLAIR were guests of honour.

Gold watches and certificates for long service were presented recently by Mr. J. CURRIE, managing director of Blackett Hutton & Company, Limited, Guisborough, to Mr. F. W. BULMER and Mr. E. WRIGHT (50 years' service); Mr. W. MILWARD and Mr. S. JOHNSON (40 years) and Mr. S. V. PARKER (25 years).

Mr. J. SAVAGE, B.SC., F.INST.P., has recently joined the board of the Continuous Casting Company, Limited, Weybridge. Prior to this appointment, he was head of the physics department of the British Iron & Steel Research Association, and there he was mainly responsible for research and development on the continuous casting of steel.

Mr. SYDNEY S. GUY, chairman and managing director of Guy Motors, Limited, Wolverhampton, and Col. ARTHUR JERRETT, the company's sales director, leaves to-day for South Africa. Whilst they are there they will visit the Capetown, Durban and Johannesburg branches of Guy Motors Africa (Pty.), Limited, and will inspect sites bought some time ago for the erection of premises in Bulawayo and Salisbury.

Mr. E. HARTLES has been appointed commercial director of McKechnie Brothers, Limited. Mr. H. F. JAMES becomes technical director and Mr. H. R. WHITTY has resigned from the board. Mr. Hartles, who has been with the company for 36 years and a department (raw materials) director for six years, will, in his capacity of commercial director, continue to look after the raw materials side of the business from Birmingham. Mr. James's executive position will be that of technical director and he will be stationed at the head office at Widnes. He was previously with the Harvey Machine Company, Inc., California.

Raw Material Markets

Iron and Steel

The opening of 1957 has not witnessed very satisfactory trading conditions for the foundry industry as a whole and business generally is much below the level of a year ago. At that time most sections of industry were well employed, with the engineering and speciality foundries particularly busy. While some of these foundries have continued to be busy, chiefly those supplying castings for machine tools, power and electrical plants, collieries, steelworks, and other trades, the units catering primarily for the motor vehicle trade have received a severe setback in business, due to several causes, including the credit squeeze, high purchase tax, foreign competition, and now, most severe of all, the petrol shortage. Operations at many of these foundries are on a short-time basis and no early improvement can be foreseen.

In the light-castings trade business was slow during the whole of last year. Some of the foundries have lately shown improved outputs, chiefly the pipe sections, but much more work is needed to keep all of them employed at a satisfactory level. The jobbing foundries are faring better, but the textile foundries would also like to see much more work coming forward.

With the reduced demands for pig-iron, outputs are sufficient to satisfy demands in all grades, except basic steelmaking pig-iron, emphasis continuing to be made on the supply of this iron to the steelworks. The blast furnaces which were switched over to this iron from the high-phosphorus foundry grade continue to supply the steelworks, and some delay is now being experienced by the foundries owing to the inability of producers of the high-phosphorus iron to deliver the required supplies, particularly in the higher silicon ranges. The low-phosphorus irons and hematite for the engineering foundries appear to cover demands fully.

The foundries are well supplied with coke and scrap and have no difficulty in obtaining the required quantities of ganister, limestone, and firebricks.

While pressure for some of the products of the rerollers has fallen during last year, they have still plenty of work on hand for both home and overseas customers. Home users continue to take up good tonnages of small bars and light sections, and there is a heavy demand for small rounds for reinforcing. Deliveries of steel semis from home steelworks are maintained at a good level, but pressure for supplies increases as stocks are reduced, coupled with the decline in imports. Demand is heavy for the smaller sized billets and carbon and alloy steels.

Non-ferrous Metals

Copper markets continue quiet. In London a fair sized turnover is being maintained and the price is reasonably steady. Stocks are falling and the backwardation has lengthened, but this would appear to be a temporary phase. Basically, consumer demand is small, world production is rising, and a gradual easing to lower price levels is expected. In America activity is modest the feature being Japanese buying. Producers and custom smelters, with one exception, are holding their price at 36 cents a pound. The export price for copper is around 34½ cents and No. 2 scrap is being offered at 28½ cents a pound. No reduction is looked for at the moment as it is felt that a lower price would do nothing to stimulate sales. The outlook for the US automobile industry is still considered good, but no major improvement is expected in the current quarter. If the UK price should go appreciably lower in the weeks ahead, US producers and custom smelters may be compelled to lower their quotations. Copper production in Chile last year expanded by almost 50,000 *tonnes* to 440,000 *tonnes*. A warning on the labour situation was sounded by the head of Chile's Copper Department, who stated that this big increase could only be maintained in 1957 " if there are harmonious conditions between workers and the enterprises."

Tin has been weak market recently and the price has been fading away to lower levels. In America the spot price is now barely $1.00 a pound. One of the main talking points has been the sale last week of the Texas tin smelter to the Wah Chang Corporation, New York, for the dollar equivalent of £486,000, plus an additional £710,000 if a success is made of the smelter operations. The smelter will be adapted to the production of tungsten and tin alloy, and will also carry out substantial smelting, subject to economic considerations. Labour conditions in the East are somewhat unsettled and there is a political crisis in Indonesia where the army has rejected the Government's authority.

Lead is quietly steady on both sides of the Atlantic. In the US stockpile buying together with day-to-day demand is sufficient to support the price at 16 cents per pound. Zinc is firm in London and fair in New York, where demand continues to be centred on " Prime Western " grade at 13½ cents per pound East St. Louis. Interest in special high grades is only moderate.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

BRIDGWATER, January 21—Cast-iron goods; lead pipe, water fittings, etc., for 12 months from April 1, for the Corporation. The Borough Engineer, Town Hall, Bridgwater (Somerset).

CANTERBURY, January 24—Castings for the year ending March 31, 1958, for the City Council. Mr. J. E. Rhodes, city engineer and surveyor, Municipal Buildings, Dane John, Canterbury.

CROYDON, January 18—Steel fabric reinforcement and dowel bars; manhole covers and frames, etc., for 12 months from April 1, for the Borough Council. The Borough Engineer, Council Offices, Croydon (Surrey).

HUNTINGDON, February 6—Manhole covers, gulley gratings, and frames, for the year ending March 31, 1958, for the Huntingdonshire County Council. Mr. T. H. Longstaff, county surveyor, Walden House, Huntingdon.

INDIA, January 29—Cast-iron pipe, for the Director-General of Supplies and Disposals. (ESB/31590/56.)

MANSFIELD, February 2—Iron castings (M.H. and gully fittings) for the year ending March 31, 1958, for the Borough Council. The Borough Engineer and Surveyor, Carr Bank, Mansfield (quoting serial No. 5).

MELTON MOWBRAY, February 4—Providing and laying approx. 8,700 yds. of 4-in. and 4,500 yds. of 3-in. dia. spun-iron class " C " water main, etc., for the Melton and Belvoir Rural District Council. The Engineer to the Council, Warwick Lodge, Dalby Road, Melton Mowbray (Leics). (Deposit, £5 5s., returnable.)

SWANSEA, January 25—Cast-iron gullies and frames; iron and steel (bar, sheet, and tubes); steel lamp pillars; manhole covers and frames; tools, etc., for 12 months from April 1, for the Borough Council. The Borough Engineer and Surveyor, Guildhall, Swansea.

EMPLOYEES OF BRIGGS MOTOR BODIES LIMITED, of Dagenham, held meetings on Tuesday to decide what action they were to take regarding the 1,000 employees who are being dismissed this week. They asked for more compensation, especially for those who had been with the firm more than 20 years.

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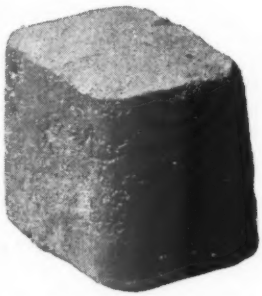

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FOUNDRY & METALLURGICAL AMS LTD

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

January 9, 1957

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £20 1s. 0d.; Birmingham, £19 13s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £21 18s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £22 2s. 3d.

Scotch Iron.—No. 3 foundry, £23 4s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £24 6s. 6d.; South Zone, £24 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £25 14s. 0d.; South Zone, £25 16s. 6d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent. :—N.-E. of England (local iron), £22 17s. 6d.; Scotland (Scotch iron), Zone S. 1, £23 4s. 0d.; Sheffield, £24 4s. 6d.; Birmingham, £24 12s. 0d.; Wales (Welsh iron), £22 17s. 6d.

Basic Pig-iron.—£19 3s. 0d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £50 0s. 0d. to £51 15s. 0d., scale 17s. 0d. to 17s. 6d. per unit; 75 per cent. Si, £70 0s. 0d. to £75 7s. 6d., scale 17s. 0d. to 17s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 28s. 6d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 12s. 3d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £250 0s. 0d.; 38/40 per cent., £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 15s. 5d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 18s. 5d. per lb. of W.

Ferro-chrome (6-10 ton lots).—4/6 per cent. C, £96 0s.0d. to £96 10s. 0d., basis 60 per cent. Cr, scale 33s. 0d. to 31s. 0d. per unit; over 6 per cent. C, £94 0s. 0d. to £95 10s. 0d., basis 60 per cent. Cr, scale 31s. 0d. per unit; 2 per cent. C,* 2s. 1½d. per lb. Cr; 1 per cent. C,* 2s. 2d. per lb. Cr; 0.15 per cent. C,* 2s. 2½d. per lb. Cr; 0.10 per cent. C,* 2s. 2¾d. per lb. Cr; 0.06 per cent. C,* 2s. 3d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 0d. to 7s. 6d. per lb.

Metallic Manganese.—90/92 per cent., carbon-free, £290 0s. 0d.; 96/98 per cent., £310 0s. 0d.

Ferro-columbium.—65/75 per cent., Nb + Ta, 22s. 6d. to 23s. 6d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £75 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £30 9s. 0d.; tested, 0.08 to 0.25 per cent. C, £31 9s. 0d.; hard (0.41 to 0.60 per cent. C), £32 10s. 6d.; silico-manganese, £41 0s. 0d.; free-cutting, £34 13s. 0d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £38 4s. 6d., silico-manganese, £41 7s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £36 3s. 6d.; basic, hard, over 0.41 up to 0.60 per cent., C, £37 6s. 0d.; acid, up to 0.25 per cent. C, £40 7s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £39 2s. 0d.; boiler plates (N.-E. Coast), £41 12s. 0d.; floor plates (N.-E. Coast), £40 11s. 0d.; sectional material, N.-E. Coast, £37 11s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested (4-ton lots), £37 18s. 0d.; flats, 5 in. wide and under (4-ton lots), £37 18s. 0d.; hoop and strip, £37 17s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g, £41 6s. 0d.; black sheets (hand mill), 17/20 g., £52 4s. 6d.; galvanized corrugated sheets, 24 g., £65 9s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £64 13s. 9d.; nickel-chrome, £88 15s. 3d.; nickel-chrome-molybdenum, £100 13s. 9d.

NON-FERROUS METALS

Copper.—Cash, £272 0s. 0d. to £272 10s. 0d.; three months, £270 0s. 0d. to £270 10s. 0d.; settlement, £272 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 7½d. per lb.; rods, 307s. 0d. per cwt. basis; 20 s.w.g., 340s. 3d. per cwt.

Tin.—Cash, £781 0s. 0d. to £782 0s. 0d.; three months, £768 0s. 0d. to £769 0s. 0d.; settlement, £782 0s. 0d.

Lead (Refined Pig).—First half January, £116 5s. 0d. to £116 10s. 0d.; first half April, £114 15s. 0d. to £115 0s. 0d.

Zinc.—First half January, £102 15s. 0d. to £103 5s. 0d.; first half April, £98 0s. 0d. to £98 5s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £132 10s. 0d.; rolled zinc (boiler plates), all English destinations, £130 5s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £110.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 2½d. per lb.; rods, drawn, 3s. 0⅞d.; sheets to 10 w.g., 230s. 9d. per cwt.; wire, 2s. 10⅝d.; rolled metal, 230s. 9d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £205; B6 (85/15), —; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), —; HTB2 (38 tons), £257; HTB3 (48 tons), —.

Gunmetal.—BS1400, LG2 (85/5/5/5), £269; LG3 (86/7/5/2), £286; G1 (88/10/2/½), £334; (88/10/2/1), £324.

Phosphor Bronze.—BS1400, PB1 (AID released), £351 per ton.

Phosphor Bronze Strip, etc.—Strip, 323s. 9d. per cwt.; sheets to 10 w.g., 323s. 9d. per cwt.; wire, 4s. 3½d. per lb.; rods, 3s. 7½d.; tubes, 3s. 5½d.; chill cast bars: solids 3s. 7½d., cored 3s. 8½d. (CHARLES CLIFFORD, LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide x 0.056, 4s. 0½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 5½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 4½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £84 10s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £197 0s. 0d.; aluminium bronze (BS1400), AB1, £295; AB2, £301. Solder, brazing, BS1945 type 8 (50/50), 3s. 1d. per lb., type 9 (54/46), 3s. 4½d. per lb.

* Average 68-70 per cent.

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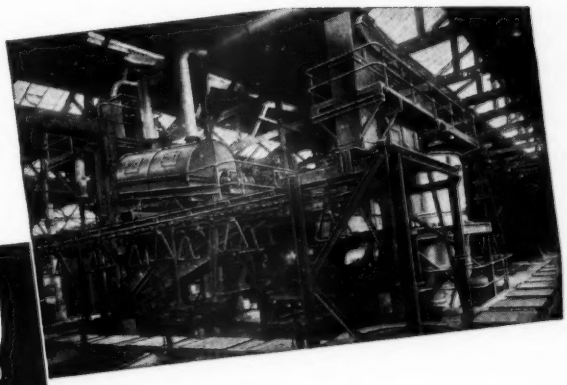

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Company News

SENTINEL (SHREWSBURY), LIMITED, manufacturers of coal-mining machinery, locomotives, etc.—The preference dividend for the half-year to December 31, 1956, is not being paid. The dividend for the first half of the year was also passed. Rolls-Royce, Limited, the parent company, has recently sold a division of the company.

CHINESE ENGINEERING & MINING COMPANY, LIMITED—Members have unanimously agreed to the change of name to Knitmaster Holdings, Limited, and to classifying a proportion of the unissued capital as ordinary shares and others as "A" non-voting ordinary 1s. shares. A new article of association dealing with the repayment of dividends has been adopted.

E. P. JENKS, LIMITED, manufacturers of steam and water fittings, brassfounders, etc., of Wolverhampton—Prospects are less stable than a year ago, states Mr. E. Percival Jenks, the chairman. Price competition will reduce margins, but a reasonable profit in the current year may be made, although it may well be less than that of the past year. Group trading profits for the year ended September 30 rose to £629,105 from £549,844 for 1954-55, and, after tax, net profits advanced to £292,837 from £247,858. Ordinary dividend is 27½ per cent. absorbing £67,994 (same).

BROOM & WADE, LIMITED—Group profits increased by over £65,500 to a further new record in the year to September 30, 1956. The dividend on the £1,250,000 ordinary stock is being raised by 2½ per cent. to 12½ per cent. with a final of 10 per cent. (7½ per cent.). Profits at £623,658 compare with the previous year's record of £558,067 and the net balance is about £30,000 higher at £298,573 (£268,180). The directors and those of Holman Bros., Limited, mining, quarrying, and pneumatic plant specialists, of Camborne (Cornwall), have agreed in principle to a merger of the two companies.

SHEEPBRIDGE ENGINEERING, LIMITED—Resolutions to convert the preference shares into ordinary, increase the authorized capital from £2,000,000 to £5,000,000 and make a one-for-two scrip issue to holders on December 31 were passed at the meeting, and renounceable allotment letters for the scrip issue were posted on Wednesday. Shareholders representing 48 per cent. of the preference shares and 42 per cent. of the ordinary returned their forms of proxy. In respect of the shareholdings for which forms of proxy were completed. 99.5 per cent. authorized the proxy to vote in favour of the resolution.

ATLAS STEEL FOUNDRY & ENGINEERING COMPANY, LIMITED—The tonnage of work in progress is almost 50 per cent. more than in 1955 and immediate prospects are favourable, states the chairman, Mr. A. C. Strathie. Net sales tonnage increased by about 11 per cent., but prices, which depend upon the class of work put out, on the average were slightly lower. Costs generally increased and materials and wages were 16 per cent. and 24 per cent. higher, respectively. The cost per ton of production rose by over £4. Trading profits increased by some £10.000 to £136,667. Net taxed profit was £48,925 (£40,868) and the dividend is 1s. 10d. (1s. 9d.) per 5s. stock unit.

R. A. LISTER & COMPANY, LIMITED, engineers and ironfounders, of Dursley (Glos)—The year to September 30 last was again a record one. Group profits exceeded £1,000,000 for the first time and an unchanged 10 per cent. dividend is declared. Sir Percy Lister, the chairman, attributes these results to the expansion over the past 10 years of productive capacity at home and the progressive development of distributing organizations in domestic and overseas markets. Factories were fully employed during the year, but with improved manufacturing methods and resources and currently greater availability of labour it should be possible to expand production flow so that, given the requisite opportunity to expand markets, progress should be continued.

AVELING-BARFORD, LIMITED, road equipment manufacturers, etc., of Grantham (Lincs)—There were fewer orders during the past four or five months, but they have levelled off at a figure which does not give cause for despondency, but which is not regarded as satisfactory, says Mr. E. Barford, executive chairman. The present international situation, he adds, is affecting overseas trade to a considerable degree and any improvement in world conditions would be of great benefit. Approximately 75 per cent. of output is now exported. For the year to September 30 last, turnover increased by over 20 per cent.—all for export—but overall profit margins were so slim that no benefit was derived. Trading profits, after depreciation, were lower—£681,143, against £727,254. The dividend is 15 (12½) per cent.

Forthcoming Events

JANUARY 14

Institution of Production Engineers

Yorkshire section:—"Physical Testing Machines," by W. B. Talbot, 7 p.m., at the Hotel Metropole, Leeds.

JANUARY 15

Institute of British Foundrymen

Bristol and West of England branch:—"Modern Aspects of Patternmaking," by B. Levy, 7.30 p.m., at the Grand Hotel, Broad Street, Bristol.

East Anglian section:—"Foundry Developments," by D. Killingworth, B.Sc., F.I.M., 7.30 p.m., at the Lecture Theatre, Public Library, Ipswich.

Slough section:—"Coreblowing," by G. W. Fearfield, 7.30 p.m., at the Lecture Theatre, High Duty Alloys, Limited.

Coventry section:—"Application of Fuel-oil to the Cupola," by W. Y. Buchanan, F.I.M., 7.30 p.m., at Room A.5, Coventry Technical College.

Institution of Production Engineers

Manchester graduate section:—"Inspection as a Management Function," by J. W. Wright, M.A.(Cantab.), 7.15 p.m., at Room C.3, Reynolds Hall, College of Technology, Sackville Street.

Institute of Metals

South Wales local section:—"Fatigue," by Major P. Litherland Teed, 6.45 p.m., Department of Metallurgy, University College, Singleton Park, Swansea.

JANUARY 16

Institute of British Foundrymen

Southampton section:—Films, "The Kitimat Story," and "Aluminium Casting," 7.30 p.m., at the Technical College, St. Mary's Street.

Institution of Works Managers

Paisley group:—"Work Study," by J. C. Campbell, 7.15 p.m., at the North British Locomotive Works.

JANUARY 17

Institute of Metals

Birmingham local section:—"Metallurgical Aspects of a Gas-turbine Engine," by S. Heslop, 6.30 p.m., at the Birmingham Exchange and Engineering Centre, Stephenson Place.

Institution of Production Engineers

Southern section:—"Electrical Accidents and Factory Regulations," by Col. Emmerson, 7.15 p.m., at the Polygon Hotel, Southampton.

JANUARY 18

Institution of Production Engineers

West Wales section:—"Industrial Productivity—Value of Work-study in Industry," by W. H. Hodgetts, 7.30 p.m., at the Central Library, Alexandra Road, Swansea.